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ABSTRACT

This teacher's guide, part of a small-engine repair series on restoring fuel systems, is designed for use with special needs students in Texas. In the guide, prerequisite skills are identified to give teachers the option of addressing these skills before or during the presentation of the fuel-system lessons. Objectives are arranged so that they may help the teachers develop individual instructional plans. The guide contains a list of vocabulary terms for fuel-system units, 27 transparency masters showing how to perform the various procedures in fuel-system services, answers to review material contained in student manuals, an evaluation model, narratives for 3 audiovisual presentations, and references. The teacher's guide also contains an overview of the fuel-system instructional materials and suggestions for using the materials. (KC)

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SMALL ENGINE REPAIR SERIES

FUEL SYSTEM

Teacher's Guide

Prepared by Pamela Hill

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Teacher's Guide for Fuel System

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PREFACE

FUEL SYSTEM, an instructional package in the Small Engine Repair series, was developed, field-reviewed, and evaluated by vocational industrial teachers who teach handicapped students about repairing small engines. This material was developed as an extension of Comprehensive Small Engine Repair by the Mid-America Vocational Curriculum Consortium, Inc., and we recommend the two be used together.

This project, now in its third year, was initiated in 1979 because it was felt that special needs students enrolled in General Mechanical Repair programs in Texas needed more appropriate instructional materials to aid their learning. The aim of this project has been twofold: (1) To task analyze the typical repair jobs of small engines and then identify the minimum required information, safety, and work habits associated with each repair job; and (2) To present this material in a variety of ways that are consistent with learning styles of special needs students with cognitive dysfunctions--primarily, the mentally retarded and learning disabled.

FUEL SYSTEM is designed with a combination of different media approaches--audio, visual, and hands-on. It is anticipated that this balanced multimedia approach will not only provide an opportunity for students to experience learning from different angles, but will also make learning more interesting and easier. Included in FUEL SYSTEM are the following instructional materials:

Audiovisuals:

1. Service the Carburetor Air Cleaner
2. Replace the Carburetor Diaphragm (Pulsa-jet Style with Automatic Choke)
3. Service the Two-Piece Flo-Jet Carburetor

Student Manuals:

Introduction: Things For You To Know
1. Service the Carburetor Air Cleaner
2. Replace the Carburetor Diaphragm (Pulsa-jet Style with Automatic Choke)
3. Service the Two-Piece Flo-Jet Carburetor)

Teacher's Guide: FUEL SYSTEM

Audiovisuals

The three audiovisual presentations portray typical carburetor repair jobs that are frequently performed in a small engine repair shop. The presentations are available in either filmstrip/cassette or slide/cassette style. They are short and concise, with simplified steps of the jobs to hold the interest of the special needs learner.

Designed to be used in both group and individual instruction, the audiovisuals may be used as a class presentation before or after

"hands-on" demonstration of the repair job. If repetition is needed in order for a student to learn the steps of a job, the presentation may also be viewed individually without teacher assistance. For the student who is an auditory learner or blind, listening to the cassettes will be an important aid in that student's ability to learn the repair jobs.

Student Manuals

Accompanying FUEL SYSTEM are four student manuals. These contain numerous illustrations and pictures, with written material on a low reading level. Each manual has its own performance objective and evaluation chart so that the students can understand what is expected and rate their own progress toward achieving the objective.

Information in Things For You To Know is given in small, sequential segments so that the students are not overwhelmed with the amount of information to be learned. With the short review sections, titled "How Much Do You Remember?", the students can individually learn the information that is grouped together before going on to the next segment of information.

Material covered in Things For You To Know is considered to be the minimum information that a student needs to know about the fuel system in order to get a small engine repair job. However, for those students who are able to learn and retain more information, it is recommended that the teacher refer to the unit on FUEL SYSTEMS in Comprehensive Small Engine Repair.

Student Manuals 1, 2, and 3 explain in pictures and short sentences the three major repair jobs of fuel systems. Among the steps of each repair job, specific safety and caution information is frequently noted throughout the manuals. To reinforce consistency in material presented to the slow learner, the pictures and written words correspond exactly with the pictures and wording on the audiovisual presentations.

The four student manuals may be used in several different ways. They may be used as a picture manual by the student, who can look at the pictures while learning the information or doing the steps of the job; they may be used as reading material to reinforce reading skills; or they may be used by the teacher to help explain information or parts of the job that are difficult to understand or see during hands-on demonstration.

Teacher's Guide

The Teacher's Guide was developed with one thought in mind--to help the teacher provide successful learning experiences for the special needs student. Student prerequisite skills have been identified to give the teacher the option of teaching these skills before or during the presentation of FUEL SYSTEM. Objectives are arranged so that they may help the teacher develop Individual Instructional Plans (IIPs). Additional resource material, such as the vocabulary terms, transparency masters, and audiovisual narratives, are given to support the variety of teaching methods.

FUEL SYSTEM may be purchased as an individual instructional package of the Small Engine Repair series, and additional student manuals may be purchased separately.

For further information or comment on FUEL SYSTEM or the Small Engine Repair Series, contact the Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas 75428.

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Recognition for the successful development of FUEL SYSTEM is given to the Industrial Employers and Teachers Advisory Committee who conscientiously gave of their knowledge and time. Special thanks is extended to the following advisory members:

Charles Francis	Briggs-Stratton Rep.	Wahlburg-McCreary, Inc. Houston
Don Talley	Talley Auto Parts Co.	Commerce
Bill Gray	Bill's Saw Shop	Greenville
Robert Smith	CVAE-GMR	El Paso ISD
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Thaddeus Curry	VEH-GMR	Klein ISD
Robert Svetlik	CVAE-GMR	Hallettsville ISD
Doyle Melton	CVAE-GMR	Austin ISD
Larry Kilbreth	CVAE-GMR	Pampa ISD
Jesse Swindle	CVAE-GMR	North Lamar ISD
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Fred Grimm	CVAE-GMR	Belton ISD
Vernon McGee	CVAE-GMR	Goose Creek ISD
Chuck Piggott	CVAE-GMR	Lyeford ISD
William Maroney	CVAE-GMR	Alamo Heights ISD
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Appreciation is also given to those General Mechanical Repair instructors who field-reviewed FUEL SYSTEM at area in-service meetings in Texas. Their supportive comments, enthusiasm, and suggestions for changes were most valuable in the completion of this project.

The project staff is also indebted to Dr. Max Plata of the Special Education Department, East Texas State University, who assisted in the development of the format for these instructional materials.

Special appreciation is extended to Tom Hill, Vocational Adjustment Coordinator, Commerce ISD, who arranged for some of the vocational students in his class to serve as models in the audiovisual presentations, and who provided valuable insight for assuring that the final product be as realistic and job-oriented as possible for special needs students.

Finally, a big "Thanks" to Brenda Reichle, the VAC student who willingly portrayed the small engine mechanic in the audiovisuals.

NOTES TO THE INSTRUCTOR

EQUIPMENT NEEDED

Before using this presentation, arrange to have the following equipment available:

Projector (either carousel slide or filmstrip type)
Carousel tray, if using slides
Projector screen
Cassette recorder
Overhead projector and other equipment necessary for making transparencies
Tools and small gas engines equipped with float carburetors and suction carburetors with an automatic choke for student use

PREPARATION BEFORE TEACHING THIS INSTRUCTIONAL PACKAGE

Before you begin teaching this instructional package, there are some things you should do:

1. Preview all instructional materials provided (Teacher's Guide, Student Manuals, and audiovisual presentations). Determine how they will be used in your class.

2. Assess each student for the Student Prerequisite Skills before introducing the instructional package. These prerequisite skills are provided in this guide.

3. Gather additional resources necessary to teach the prerequisite skills to those students who are deficient.

4. Teach the prerequisite skills to those students who need them.

This will help ensure successful learning of FUEL SYSTEM by each student.

STUDENT GOAL AND OBJECTIVES

The student goal and objectives for this instructional package are provided on page 7. These are to assist you in writing each student's Individual Instructional Plan (IIP). The student goal and objectives are also given to the student at the beginning of each student manual. They are titled "The Point of This Booklet" and "What You Will Have to Know and Do." The goal and objectives have been rewritten at a level which is understandable to the student.

1. Discuss the goal and objectives with each student so that it is clearly understood what is expected of them.

2. Add any additional objectives such as the prerequisite skills which need to be learned by the student.

EVALUATION CHARTS

It is encouraged that a grading system not be based on a written test, but rather on individual physical performance of the objectives by each student. Evaluation charts are provided at the end of each student manual. The charts are intended for use as grading instruments and as motivational aids by rating personal progress toward the objectives.

1. Discuss with the students how they will be evaluated, based on individual performance shown by the evaluation charts.

2. See the section titled "Evaluation Model" for specific instructions on how to use the evaluation charts.

TRANSPARENCY MASTERS

Numerous 8½" x 10" illustrations have been provided in the Teacher's Guide to be used in a variety of ways.

1. As transparencies. If so, make an acetate of each illustration so that it may be projected onto a screen, using an overhead projector.

2. Copied and used as hand-outs to students.

3. As review activities; i.e., students are asked to identify items on an illustration in which the names of parts have been erased.

4. As display material for bulletin board.

INTRODUCTION: THINGS FOR YOU TO KNOW

1. Before introducing the three repair jobs of the fuel system, first teach the minimum information, safety, and good work habits that are presented.

2. For those students who are able to read and benefit from the activities, provide them with their own manual.

3. Using the transparencies and any additional resource material, teach the information provided in small, sequential steps.

4. Reinforce the learning of this information by having the student complete the activities in the section, "How Much Do You Remember?"

5. Frequently review the information to be learned in short, 15-minute practice sessions that can be spaced throughout other shop activities.

6. Provide for over-learning by giving the student additional reinforcement activities.

7. Make sure the student has mastered previously taught information before introducing new information to be learned.

8. Share with the student's special education teacher THINGS FOR YOU TO KNOW, the transparencies, and the vocabulary terms so that this information can be reinforced with the student.

AUDIOVISUALS AND STUDENT MANUALS 1, 2, and 3

1. When introducing each of the repair jobs of the starting system, use a combination of teacher demonstration, viewing of the audiovisual presentation, and student hands-on experience with an engine which is equipped with the correct type carburetor.

2. Present the steps to each repair job in small, sequenced amounts so that each step is mastered by the student.

3. Have the student who needs additional help view the audiovisual presentation while doing each step of the job on an engine. This can be accomplished by having the student manually advance the cassette and projector once a previously viewed step has been completed by the student on an engine.

4. For those students who are visual learners or able to read on a 4.5 grade reading level, provide them with their own Student Manuals 1, 2, and 3.

5. As the repair jobs are taught and the students practice learning the steps, have the students rate their progress using the evaluation charts found in the back of the student manuals.

6. Share with the student's special education teacher Student Manuals 1, 2, and 3, as reading reinforcement materials to be used by the student.

STUDENT PREREQUISITE SKILLS

Listed below are prerequisite skills the student needs in order to successfully learn fuel system repair jobs. It is recommended that the instructor teach these skills before or during the student learning of this instructional package.

PREREQUISITE SKILLS	SUGGESTED ACTIVITIES
1. Demonstrates a working knowledge of commonly used vocabulary terms associated with small gas engines.	Discuss "Vocabulary Terms" provided in the Teacher's Guide; use the "Vocabulary Terms" as a transparency and student handout; provide student drills on the terms, and other teacher-made reinforcement activities.
2. Demonstrates proper use and safety of the following tools: socket set screwdrivers: Phillips, flat-tip, carburetor-jet types pliers: combination and needle nose types open-end wrench compressed air safety glasses wire brush straightedge feeler gauge soap motor oil gasoline carburetor cleaner hand cleaner shop towels pan with water parts container	Use Transparency Masters 25, 26 and 27, selected TMs 17-24. Safety To Follow, and any additional resource material on tools.
3. Matches correct sockets with the spark plug and bolts on the engine	Provide student with can of nuts and bolts and instruct student to find matching pairs. (This gives practice in matching sizes.)
4. Determines whether bolts have a right- or left-hand thread and then turns the socket in the correct direction to remove and replace them.	

PREREQUISITE SKILLS	SUGGESTED ACTIVITIES
5. Measures correct amount (approx. 2 T) of motor oil onto air cleaner element.	Demonstrate with a tablespoon 2 T of oil; have student practice measuring this amount of oil onto air cleaner elements.
6. Removes and replaces governor spring on throttle by correctly twisting the spring.	Use Transparency Masters 1 and 2 and demonstrate on engine the steps for removing and replacing the governor spring on the throttle; have students practice these steps on an engine.
7. Removes and replaces "O" ring in carburetor.	Demonstrate steps for removing and replacing "O" ring in carburetor and have student practice these steps on a carburetor.
8. Measures with feeler gauge and subtracts differences when checking for wear in the throttle shaft of a 2-piece float carburetor.	Practice measuring different clearance sizes with a feeler gauge on engine parts and subtracting the differences.
9. Determines a 2-minute and 20-minute time span (2 minutes for allowing engine to warm-up and 20 minutes for allowing carburetor parts to soak in carburetor cleaner.	While doing these activities, have student practice timing them by using a clock.
10. Replaces and adjusts idle and high speed needle valves correctly by turning them back 3/4 turn and 1 1/2 turns respectively.	Demonstrates 3/4 turn and 1 1/2 turns; have student practice replacing and adjusting idle and high speed needle valves in a carburetor that has been removed from the engine.
11. Adjusts carburetor until engine idles smoothly and then accelerates without hesitation or sputtering.	Demonstrates adjusting the carburetor to richen and lean the air-fuel mixture on a running engine; demonstrate the different sounds an engine will make when the carburetor is adjusted; have student practice adjusting carburetors on running engines until they can adjust the carburetor correctly to the sound of an engine that idles smoothly and then accelerates without hesitation or sputtering.

STUDENT GOAL AND OBJECTIVES

The following are provided to assist in the development and writing of each student's Individual Instructional Plan (IIP). Built into these objectives is the use of the evaluation charts found at the end of each student manual. You will want to use these charts for monitoring each student's progress toward these objectives. Criterion for competency or the rating that a student must achieve for a predetermined length of time is suggested as a rating of 3 for three consecutive days on the evaluation charts. See "Evaluation Model," page 71, for further information.

LONG-TERM GOAL: After completing FUEL SYSTEM, the student will be able to identify fuel system information and demonstrate safety, good work habits, and 3 repair jobs of the fuel system on small gas engines which are necessary for employment as a small engine mechanic.

SHORT-TERM OBJECTIVES	ACTIVITIES AND MATERIALS
1. Given information about the fuel system of small gas engines, the student will understand and explain the following information for three consecutive days: *Tell what the fuel system is *Name and find the parts of the fuel system *Tell what the fuel system parts do *Identify the 3 types of fuel-feed systems *Tell what the air cleaner does *Tell why it's important to service the air cleaner *Name and find the parts of the air cleaner *Identify the 3 types of air cleaners *Tell what the carburetor does *Name and tell what the 3 carburetor controls do	1. Read or listen to information about the fuel system (pages 4-73) in Things for You to Know. 2. Using the transparency masters Teacher's Guide, and different types of fuel systems, carburetors, and air cleaners on small gas engines, participate in class discussions and drills on the information to be learned. 3. Answer the review questions on "How Much Do You Remember?" in Things For You To Know. 4. Using the chart "Things For You To Know About the Fuel System" pages 74-77, in Things For You To Know, rate the student progress for two consecutive weeks or until a rating of 3 for three consecutive days is achieved.

SHORT-TERM OBJECTIVES	ACTIVITIES AND MATERIALS
*Name and identify the 3 types of carburetors *Name and find the parts of a suction carburetor with an automatic choke *Tell what the parts of a suction carburetor with an automatic choke do *Tell how the automatic choke works *Name and find the parts of a 2-piece float carburetor *Tell what the parts of a 2-piece float carburetor do	

NOTE TO THE INSTRUCTOR: Teach each of the above subobjectives separately. Evaluate the student's ability to understand and explain the subobjective before introducing the next one.

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2. Given information on safety and good work habits to follow, the student will demonstrate them most of the time for three consecutive days while doing repair jobs on the fuel system.	1. Read or listen to information about Safety (pages 78-95) in Things for You to Know. 2. Using the transparency masters, Teacher's Guide, participate in class discussion on the importance of following the safety and good work habits. 3. Answer the review questions on "How Much Do You Remember?" pages 86 and 92, Things For You To Know. 4. Using the chart "Can You Follow Safety and Good Work Habits?" page 96, Things For You To Know, rate the student progress for two consecutive weeks or until a rating of 3 for three consecutive days is achieved.

SHORT TERM OBJECTIVES	ACTIVITIES AND MATERIALS
3. Given a small gas engine with an oil foam air cleaner and the correct tools, the student will service the carburetor air cleaner by correctly following all the steps without help for three consecutive days.	1. Observe the teacher servicing the carburetor air cleaner on a small gas engine. 2. Watch the audiovisual presentation "Service the Carburetor Air Cleaner," and participate in class discussions on this job. 3. Using Student Manual 1, read the words or follow the pictures which describe the steps in servicing the carburetor air cleaner. 4. Using a small gas engine with an oil foam air cleaner and the correct tools, practice the steps in servicing the carburetor air cleaner. 5. Using the chart "Can You Service the Carburetor Air Cleaner?" page 21, Student Manual 1, rate the student progress for two consecutive weeks. 6. Repeat above activities (1 through 5) until a rating of 3 on the chart "Can You Service the Carburetor Air Cleaner?" is achieved for three consecutive days.
4. Given a small gas engine with a suction carburetor and automatic choke and the correct tools, the student will repair the starter rewind spring by correctly following all the steps without help for three consecutive days.	1. Observe the teacher replacing the carburetor diaphragm on a small gas engine. 2. Watch the audiovisual presentation "Replace the Carburetor Diaphragm," and participate in class discussions on this job. 3. Using Student Manual 2, read the words or follow the pictures which describe the steps in replacing the carburetor diaphragm.

SHORT TERM OBJECTIVES	ACTIVITIES AND MATERIALS
	4. Using a suction carburetor with an automatic choke on a small gas engine and the correct tools, practice the steps in replacing the carburetor diaphragm. 5. Using the chart "Can You Replace the Carburetor Diaphragm?" page 30, Student Manual 2, rate the student progress for two consecutive weeks. 6. Repeat above activities (1 through 5) until a rating of 3 on the chart "Can You Replace the Carburetor Diaphragm?" is achieved for three consecutive days.
5. Given a small gas engine with a 2-piece float carburetor and the correct tools, the student will service the float carburetor by correctly following all the steps without help for three consecutive days.	1. Observe the teacher servicing the 2-piece float carburetor on a small gas engine. 2. Watch the audiovisual presentation "Service the Two-Piece Flo-Jet Carburetor" and participate in class discussion on this job. 3. Using Student Manual 3, read the words or follow the pictures which describe the steps in servicing the 2-piece float carburetor. 4. Using a 2-piece float carburetor on a small gas engine and the correct tools, practice the steps in servicing the 2-piece float carburetor. 5. Using the chart "Can You Service the Two-Piece Flo-Jet Carburetor?" page 35, Student Manual 3, rate the student progress for two consecutive weeks. 6. Repeat above activities (1 through 5) until a rating of 3 on the chart "Can You Service the Two-Piece Flo-Jet Carburetor?" is achieved for three consecutive days.

VOCABULARY TERMS FOR FUEL SYSTEM

The following vocabulary terms are words that are frequently found throughout this instructional package. These terms and their definitions are provided to aid the student in developing a common language that is often used in the small engine repair classroom. For more vocabulary terms such as engine parts that are defined, refer to the student manual, Introduction: Things for You To Know.

1. Brittle--easily broken or crumbled.
2. Caution--a warning that you should pay attention to and follow or you may break a part of the engine or the tool you are working with.
3. Check--look at something to see if it is broken.
4. Clearance--the space allowed between two parts, such as the space on a carburetor between the top of the float and the bottom of the upper carburetor body.
5. Clockwise--turning toward the right.
6. Combustion--the process of burning the air-fuel mixture in the combustion chamber.
7. Counter clockwise--turning toward the left.
8. Foul the spark plug--the spark plug becomes covered with oil, dirt, and/or carbon buildup.
9. Idle speed--the slowest possible speed that the engine can run on without stopping.
10. Lean air fuel mixture--mixture of air and gasoline from the carburetor that does not contain enough gasoline in the mixture to burn. A lean air-fuel mixture will cause the engine to constantly speed up and slow down, possibly overheat, and cause a severe loss of engine power.
11. Load conditions--how hard the engine must run depending on how difficult the work is; for example,if a lawnmower is required to mow a lawn with grass that is 2 feet tall, the engine must work much harder than if it were required to mow a lawn with grass that is only 6 inches tall.
12. Protective seal--a tight fit so that air cannot get through.
13. Reassemble--put the engine parts back together.
14. Remove--to take something out of or off of the engine.
15. Replace--(a) to take out a worn or broken part of the engine and put in a new part; (b) also to put back an engine part that was not worn or broken.

16. Rich air-fuel mixture--mixture of air and gasoline from the carburetor that has too much gas in the mixture for the engine to burn. A rich air-fuel mixture will cause the engine to give off black smoke and carbon buildup on the pistons and valves and cause a loss of engine power.

17. Safety tip--a warning that you should pay attention to and follow or you may get hurt.

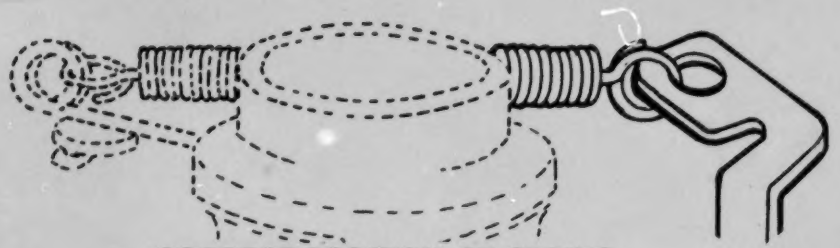
18. Service--to check and repair and/or replace a part on an engine.

19. Venturi--that part of the carburetor where the air comes into the carburetor from the air cleaner and where the walls of the carburetor are closer together, making the passageway for the air narrower than in any other part of the carburetor.

20. Viscosity of oil--the resistance of oil to flow; has to do with how thick the oil is.

21. Warpage--a twist or curve that has developed in metal that was originally flat,like the top of the fuel tank or the two sides of a 2-piece float carburetor that attach together.

REMOVE GOVERNOR SPRING FROM THROTTLE LEVER

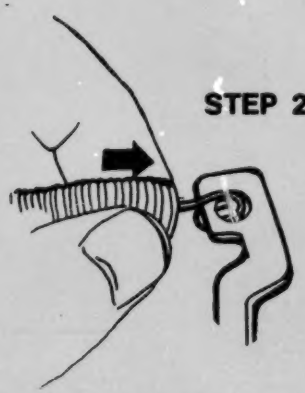


CORRECT POSITION OF SPRING
End of loop is up and toward the engine

STEP 1

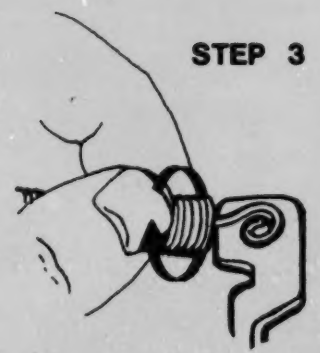
Twist spring toward engine until loop end is facing down

STEP 2



Push spring forward and up

STEP 3



Twist spring toward engine again until loop end snaps out of hole in lever

TM-1

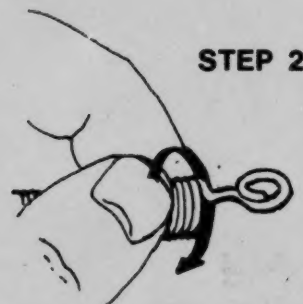
13

REPLACE GOVERNOR SPRING ON THROTTLE LEVER

STEP 1

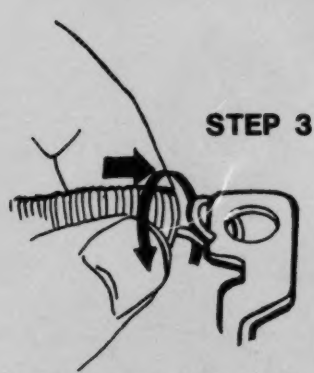
Grasp end of spring with loop end facing down

STEP 2

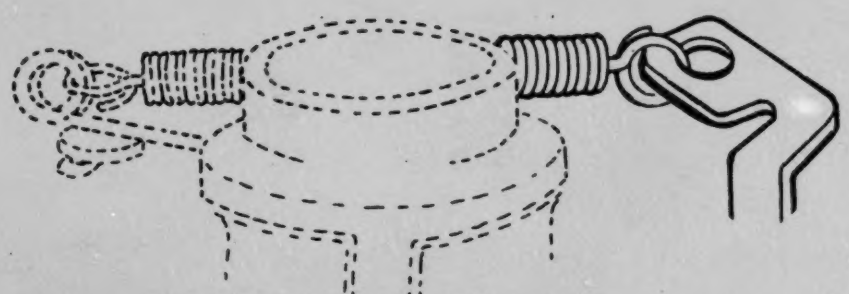


Twist spring ¾ turn toward engine until loop end is facing up

STEP 3



Push loop end into hole and then twist spring away from engine until end of loop snaps into hole



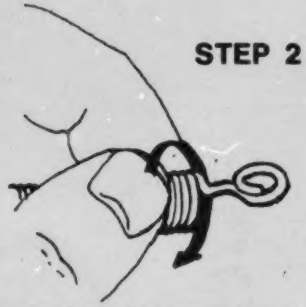
CORRECT POSITION OF SPRING

REPLACE GOVERNOR SPRING ON THROTTLE LEVER

STEP 1

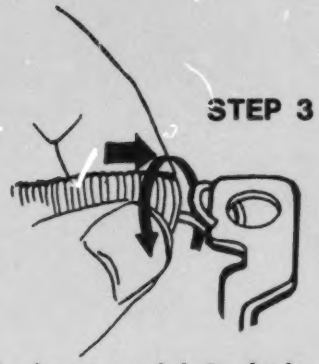
Grasp end of spring with loop end facing down

STEP 2

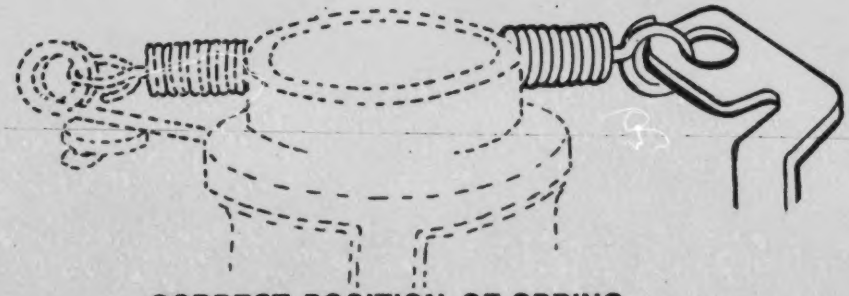


Twist spring ¾ turn toward engine until loop end is facing up

STEP 3

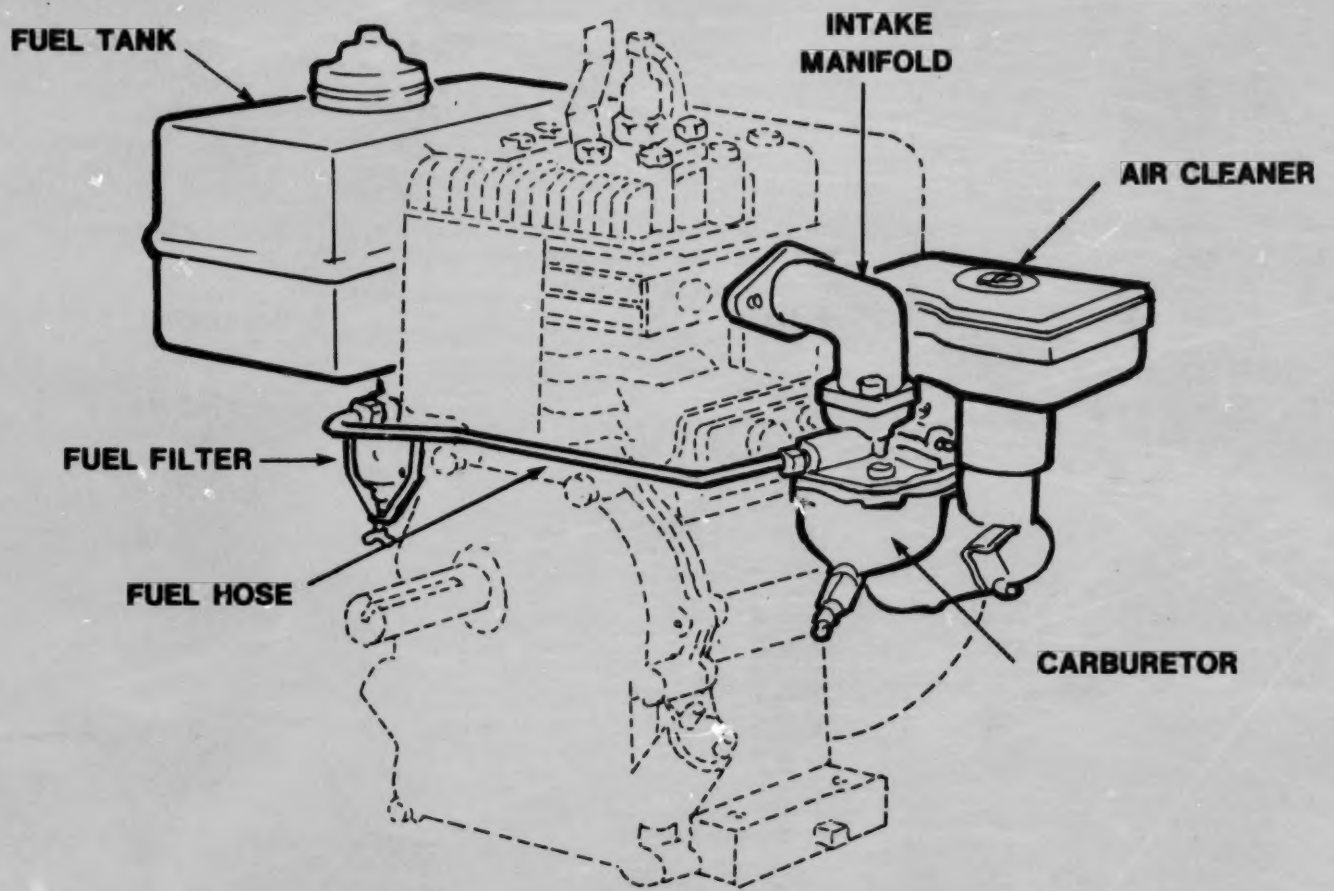


Push loop end into hole and then twist spring away from engine until end of loop snaps into hole



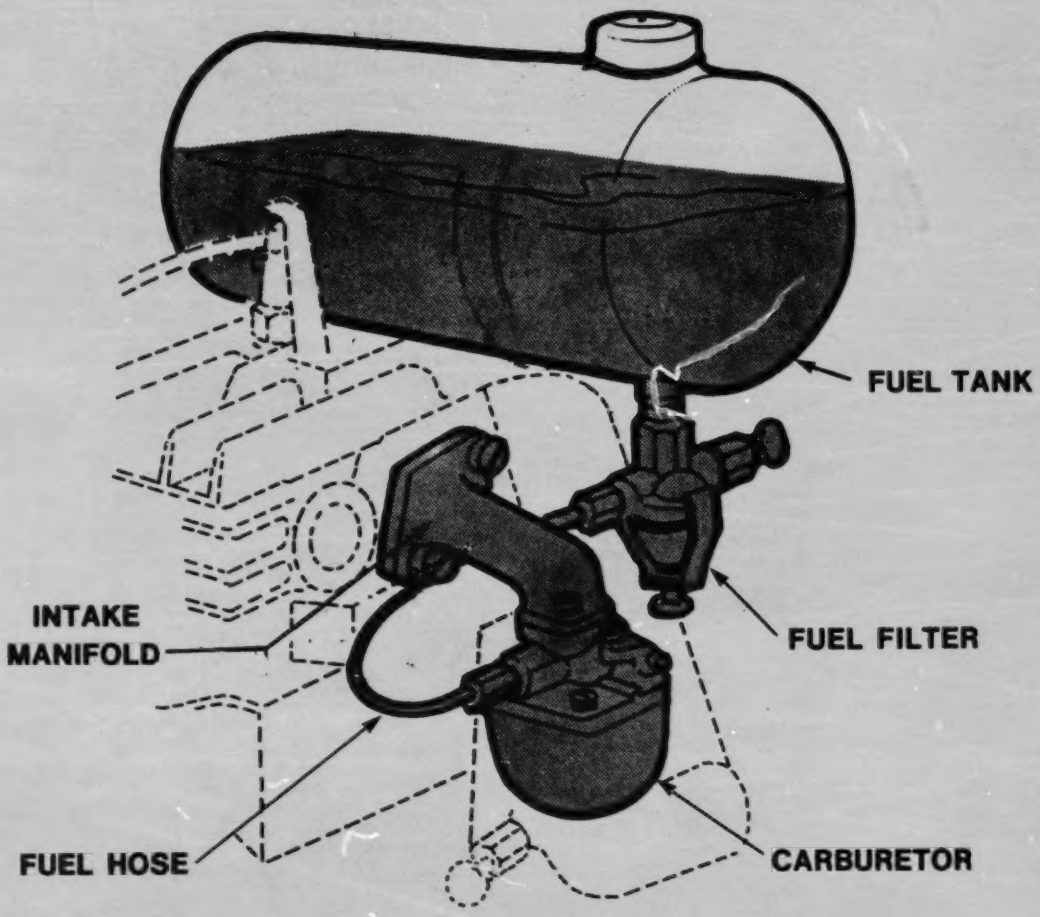
CORRECT POSITION OF SPRING

MAJOR PARTS OF THE FUEL SYSTEM

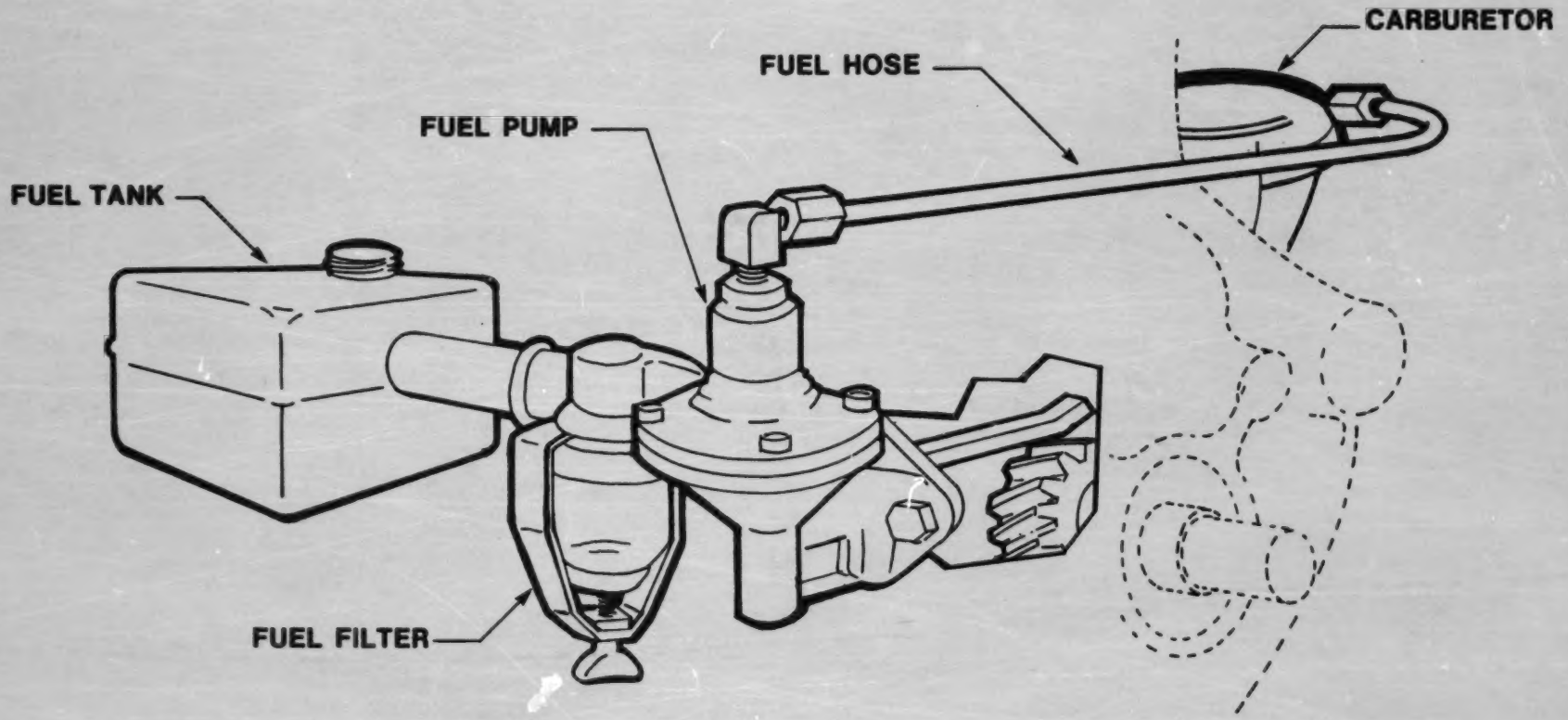


TM-3

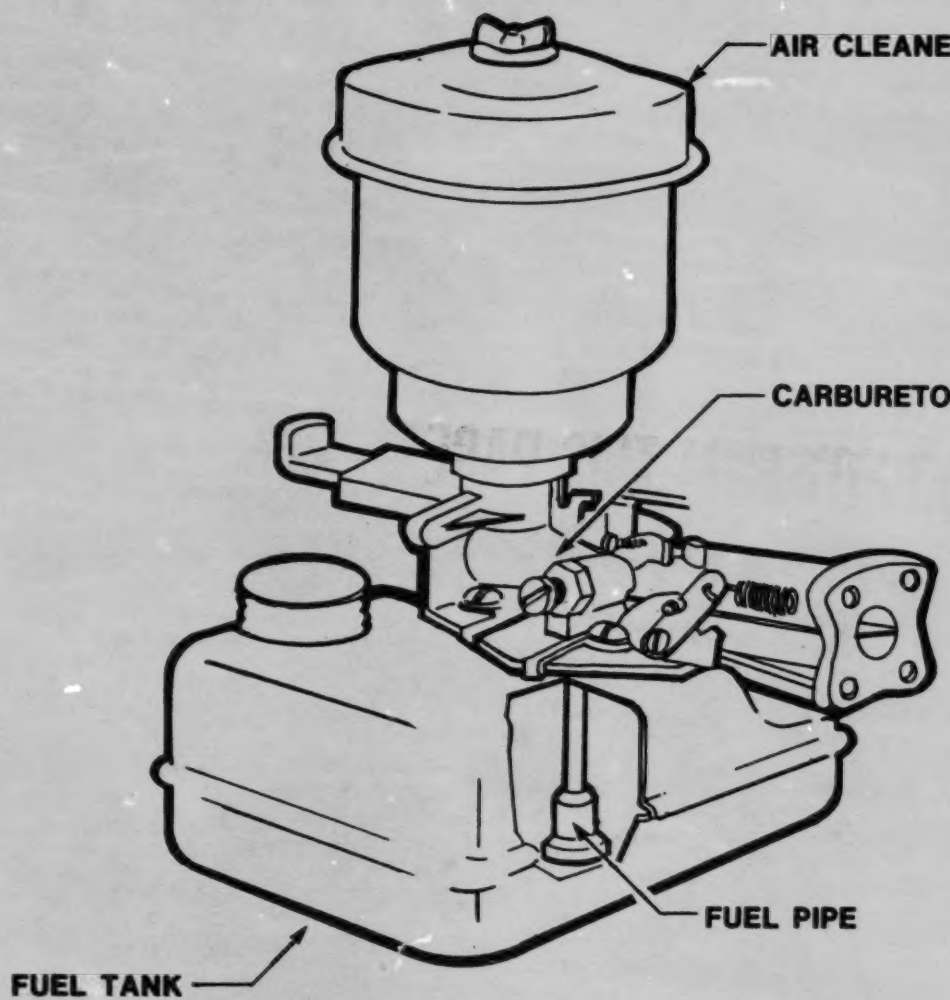
GRAVITY-FEED FUEL SYSTEM



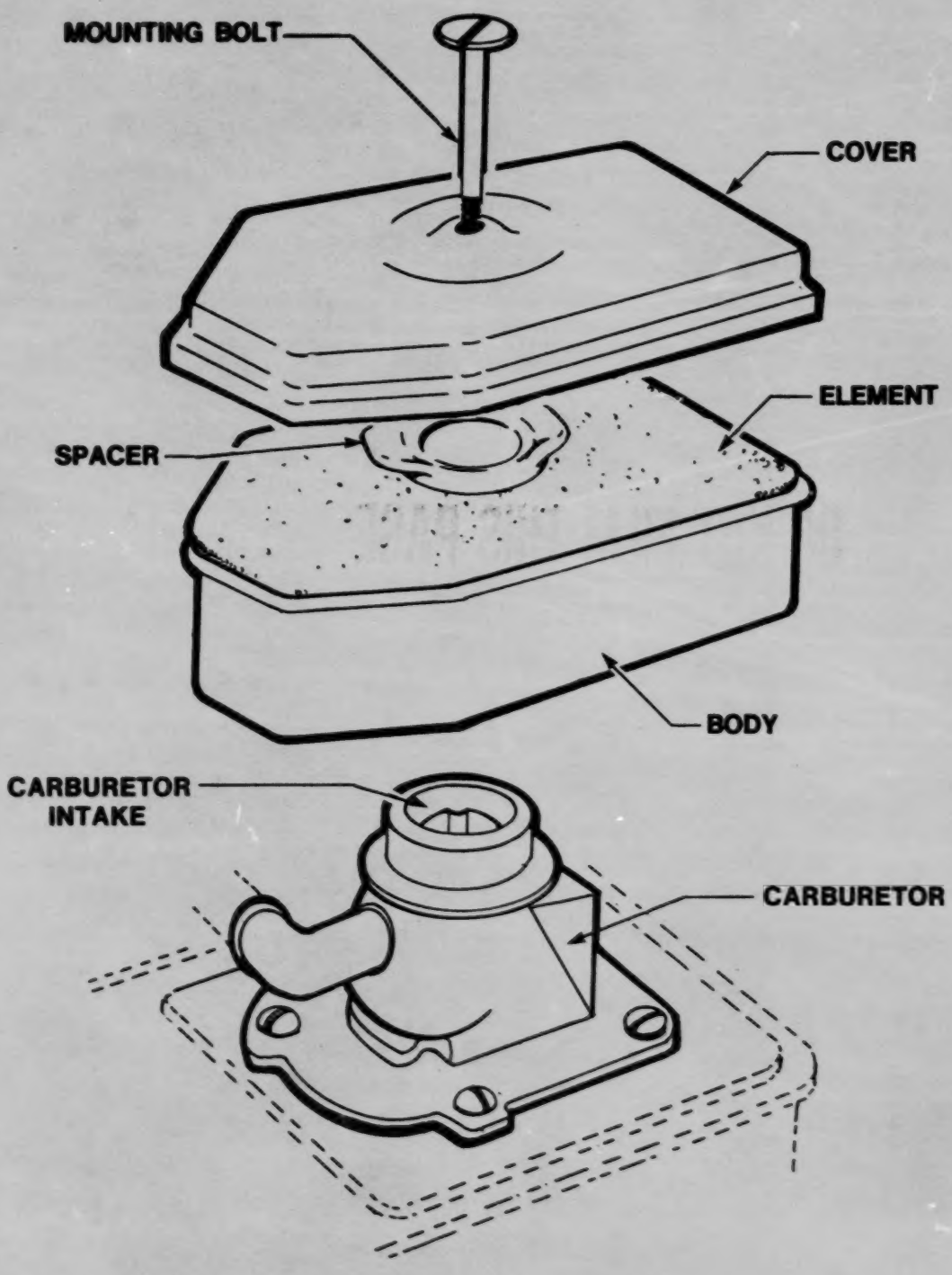
PUMP-FEED FUEL SYSTEM



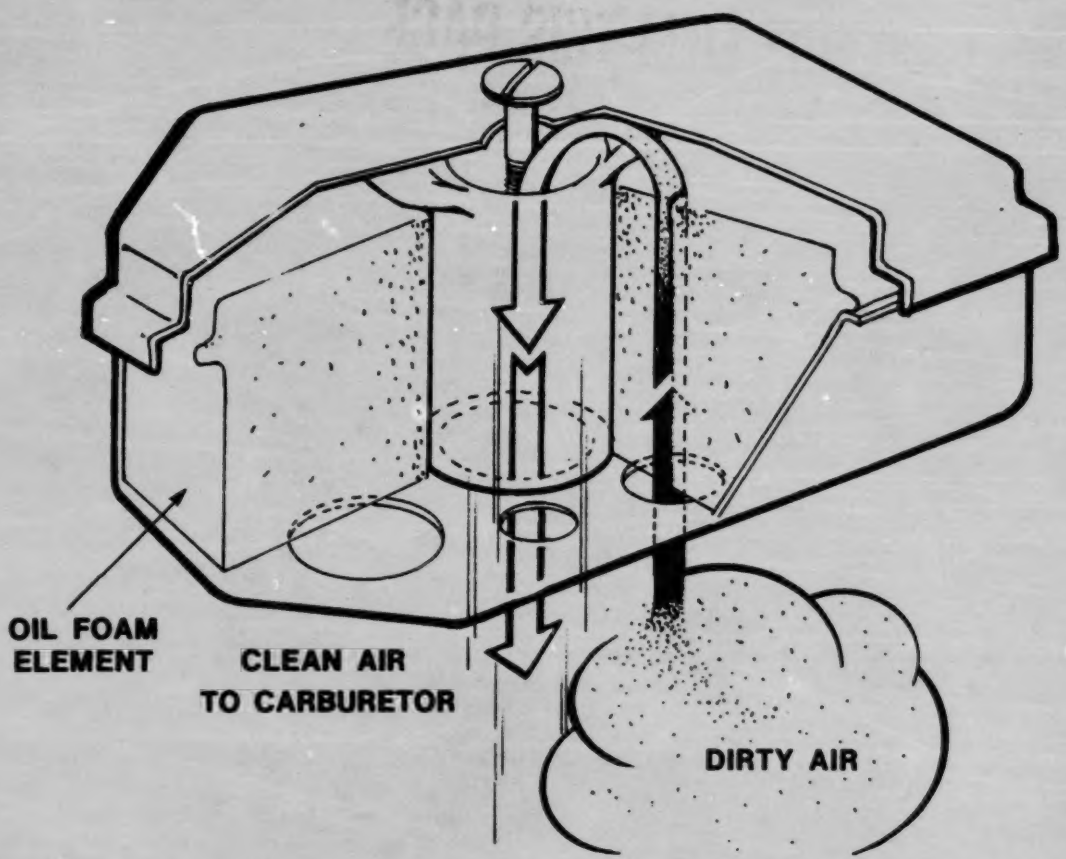
SUCTION-FEED FUEL SYSTEM



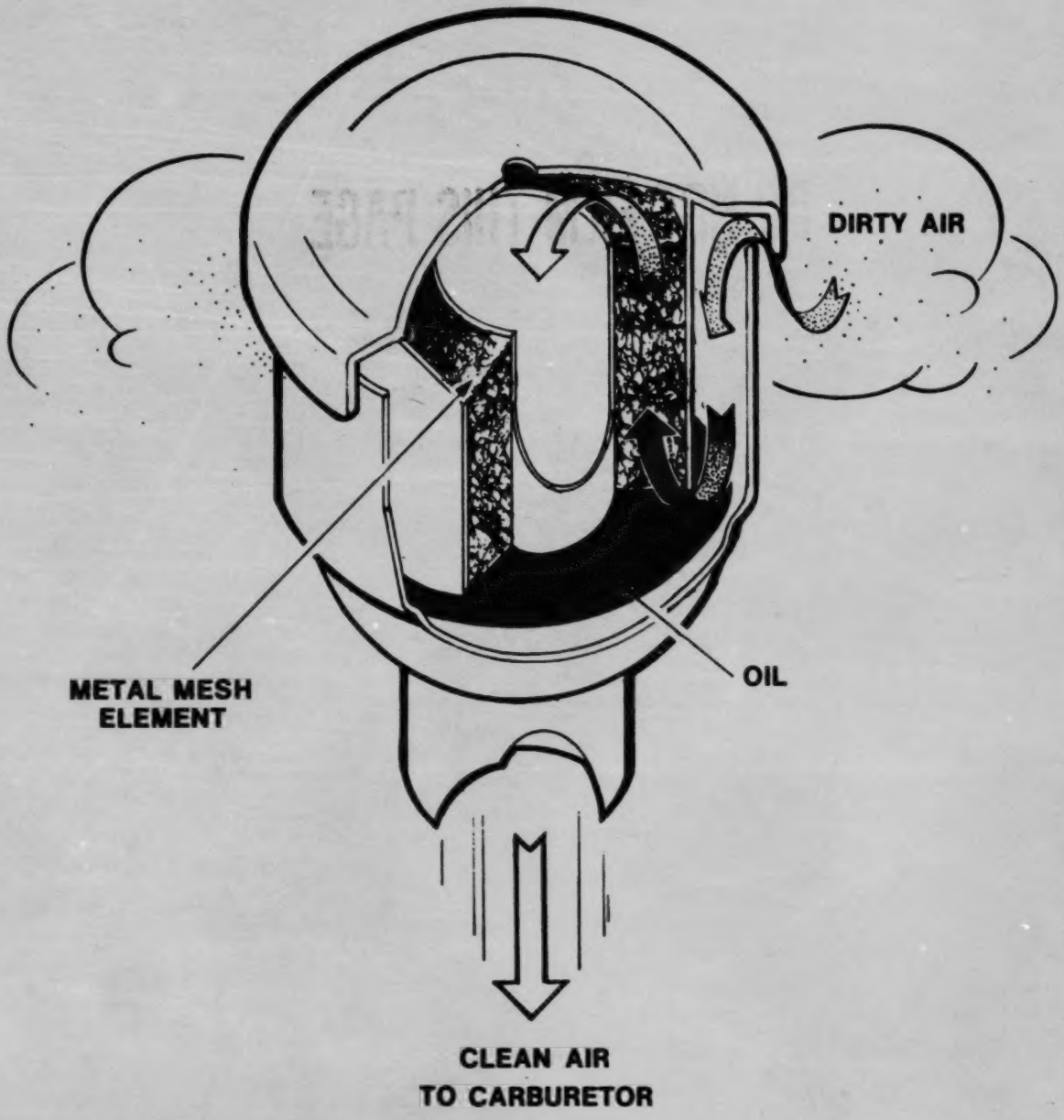
PARTS OF AN AIR CLEANER



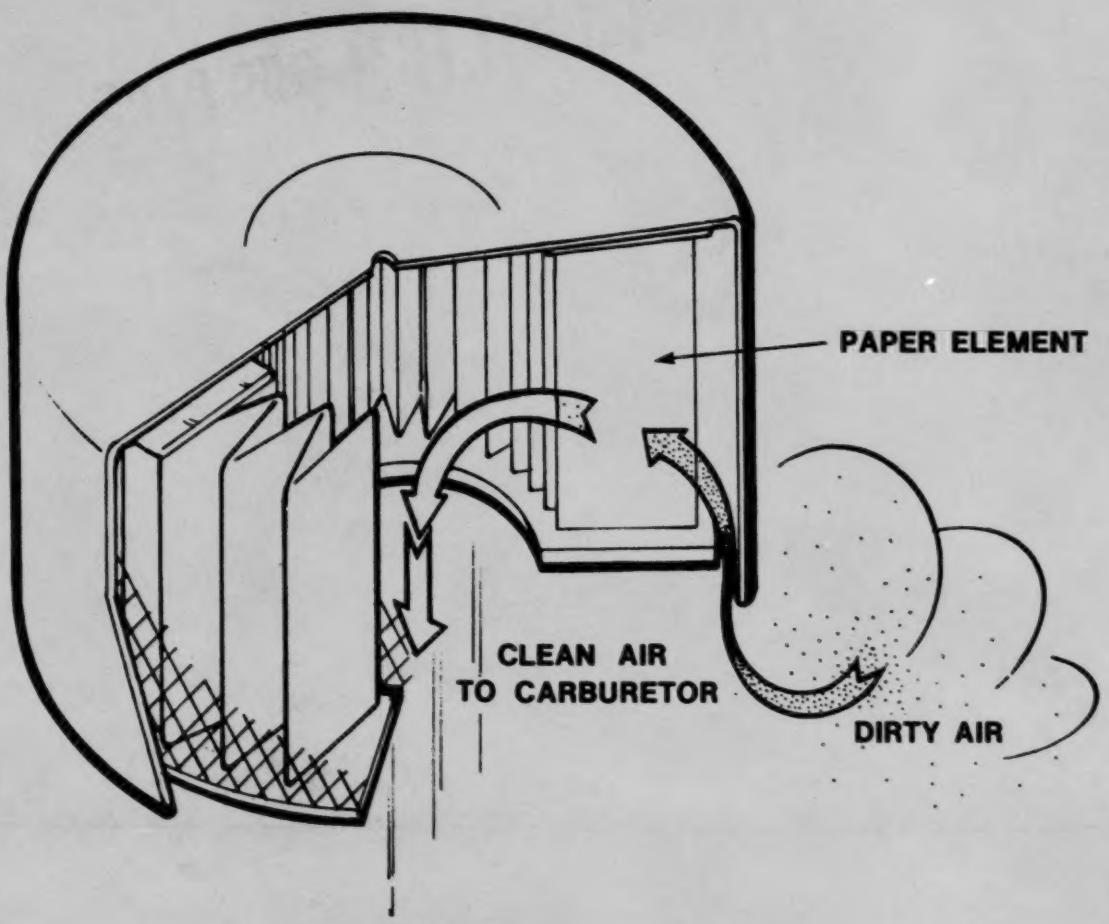
OIL-FOAM AIR CLEANER



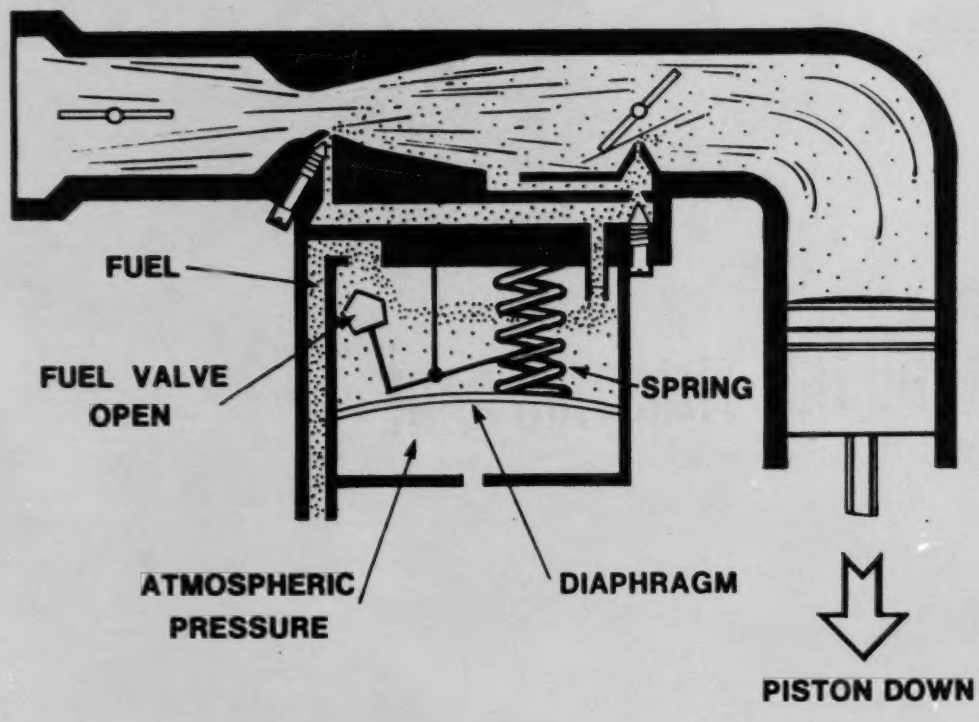
OIL-BATH AIR CLEANER

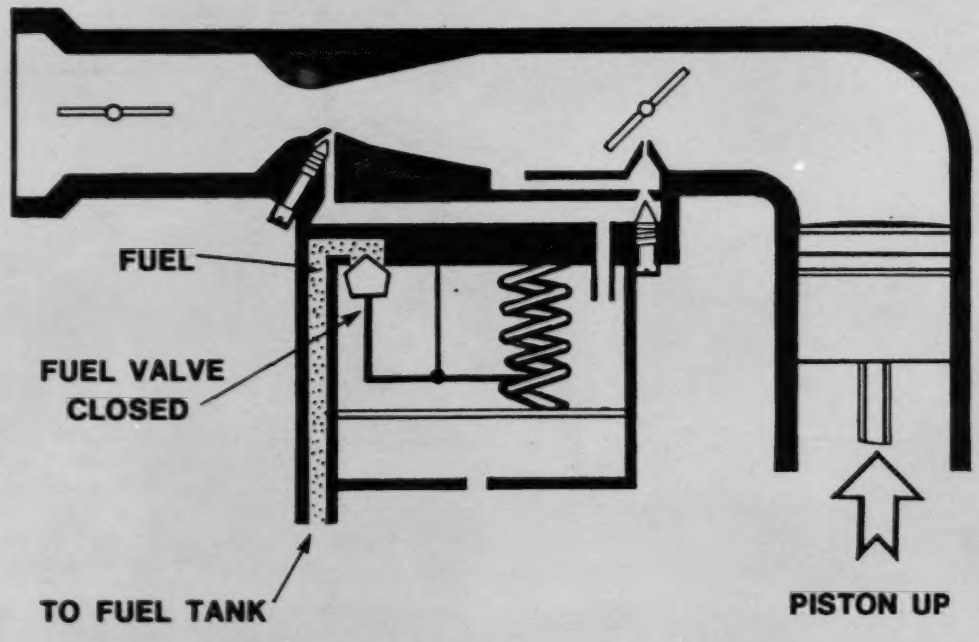


DRY AIR CLEANER



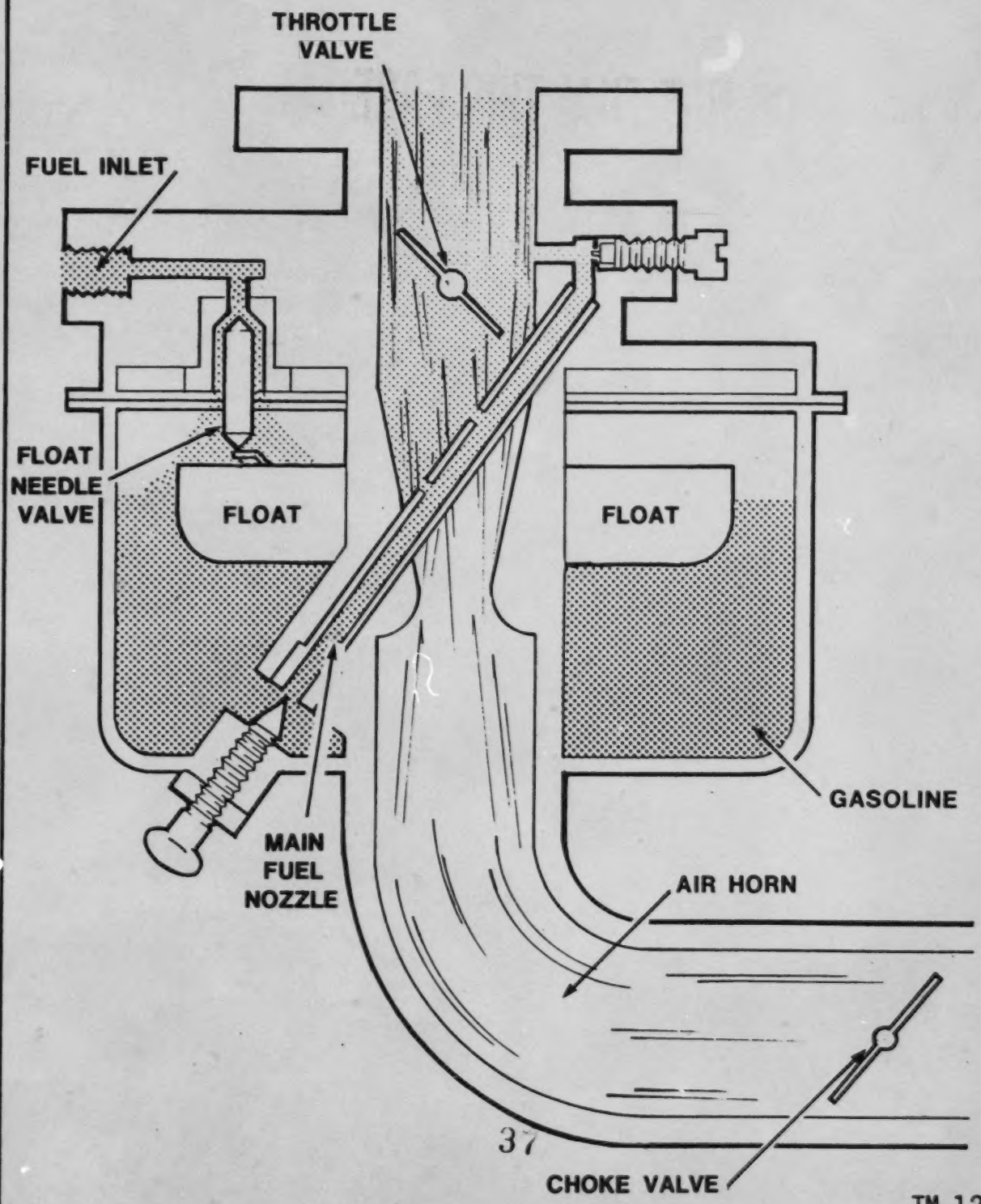
DIAPHRAGM-TYPE CARBURETOR





TM-11

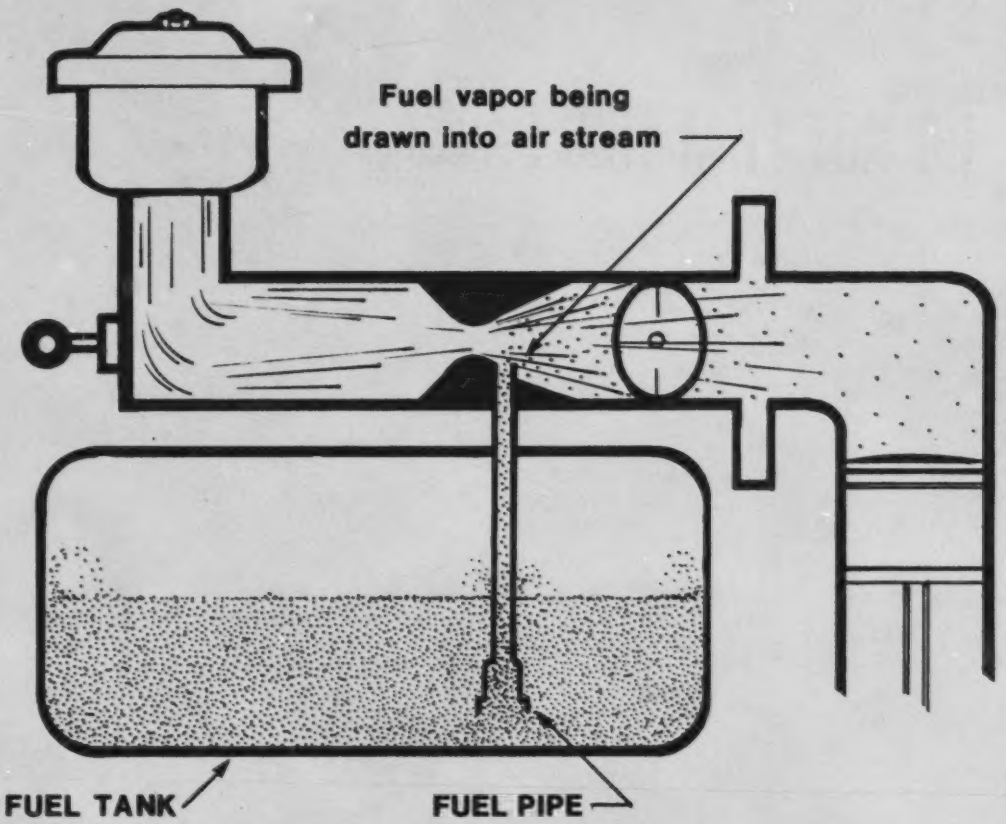
FLOAT-TYPE CARBURETOR



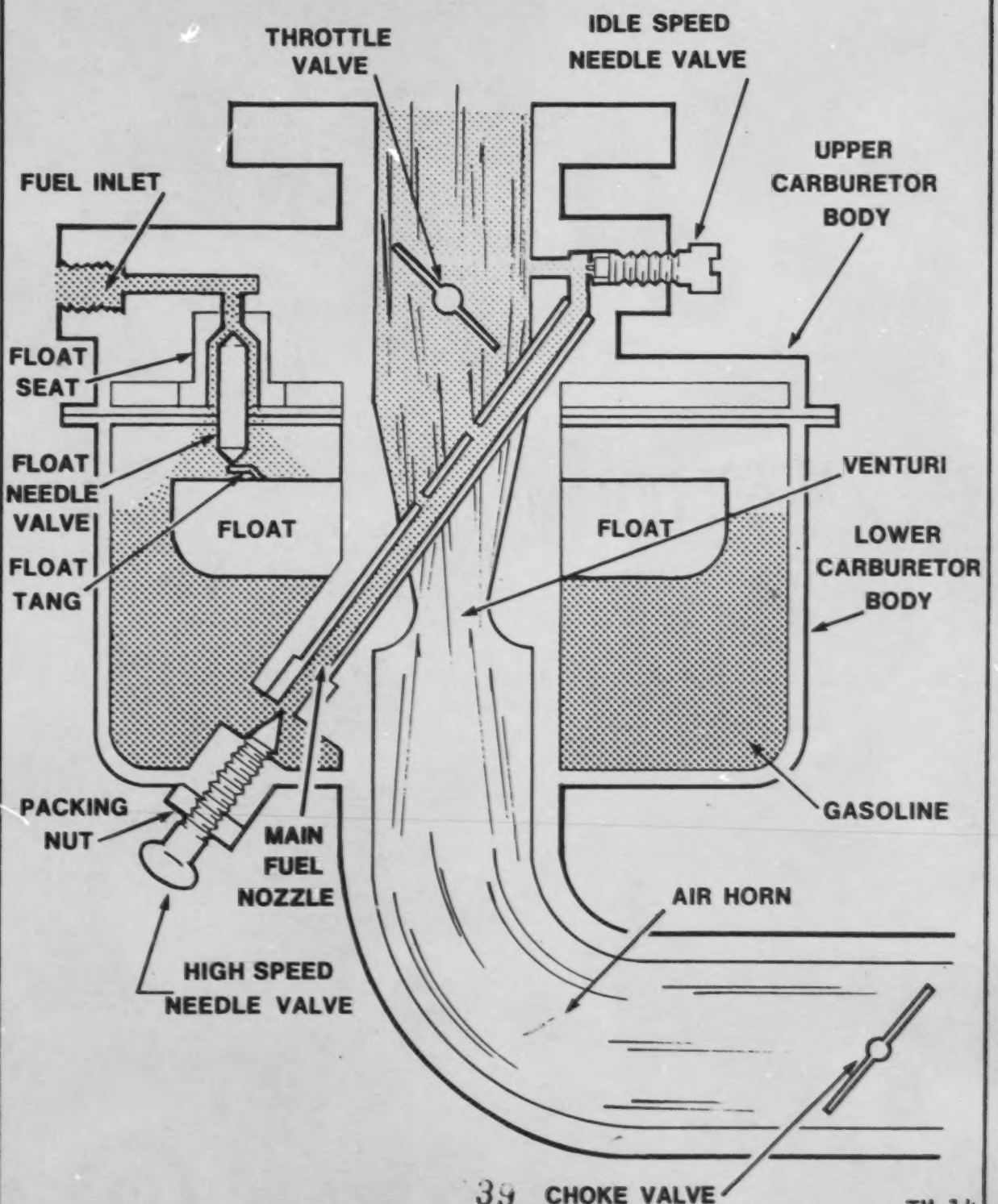
37

TM-12

SUCTION-TYPE CARBURETOR

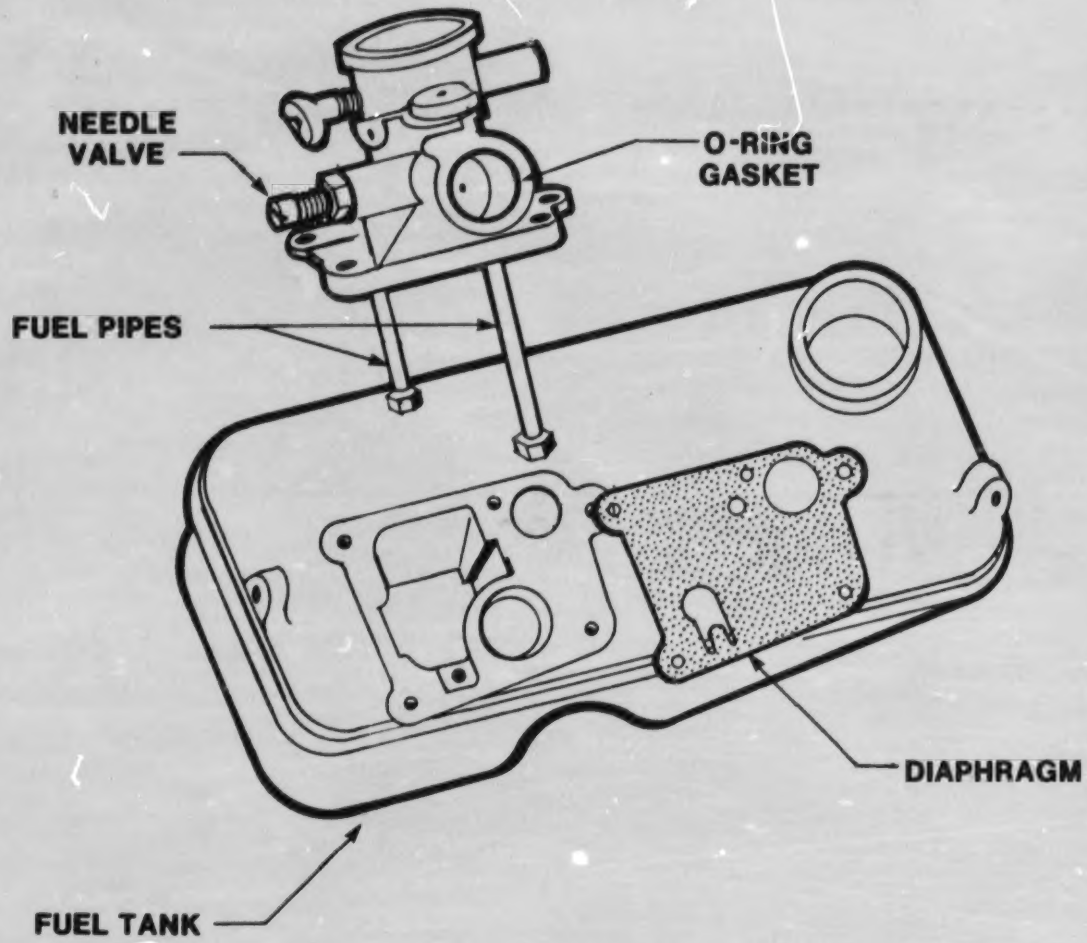


PARTS OF A TWO-PIECE FLOAT CARBURETOR

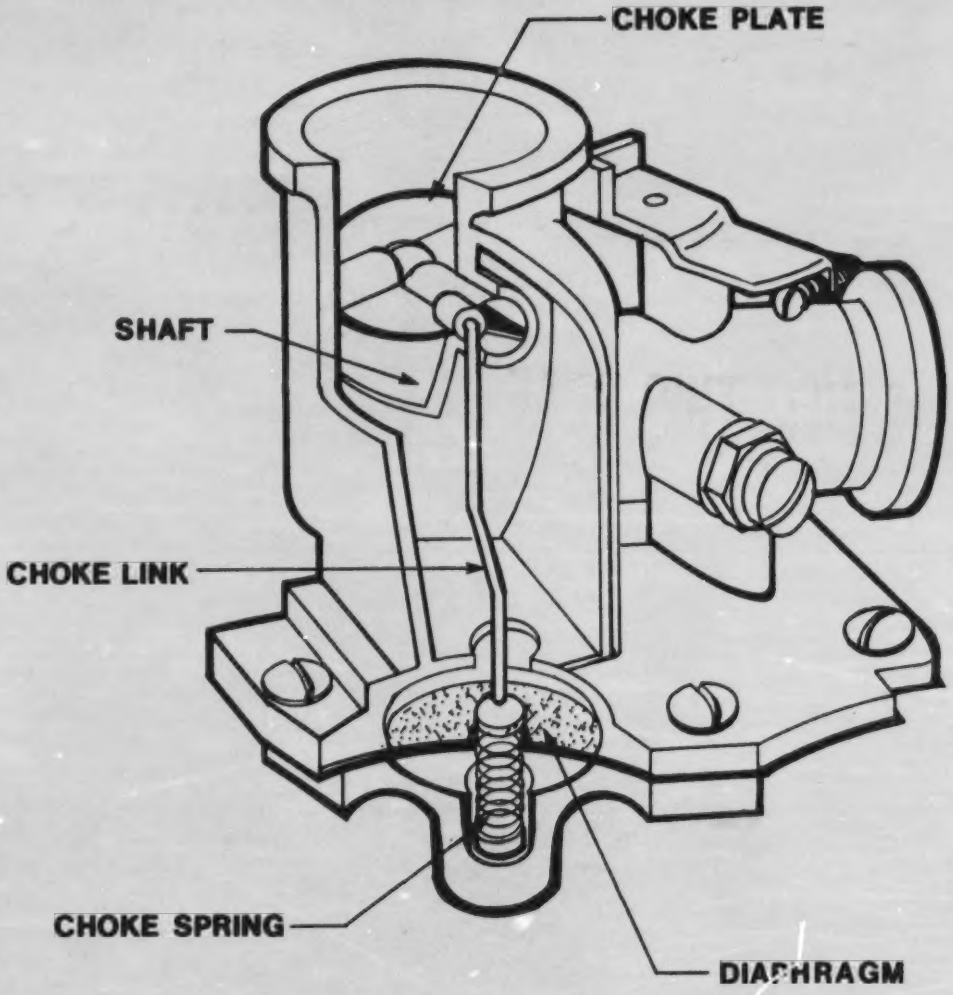


TM-14

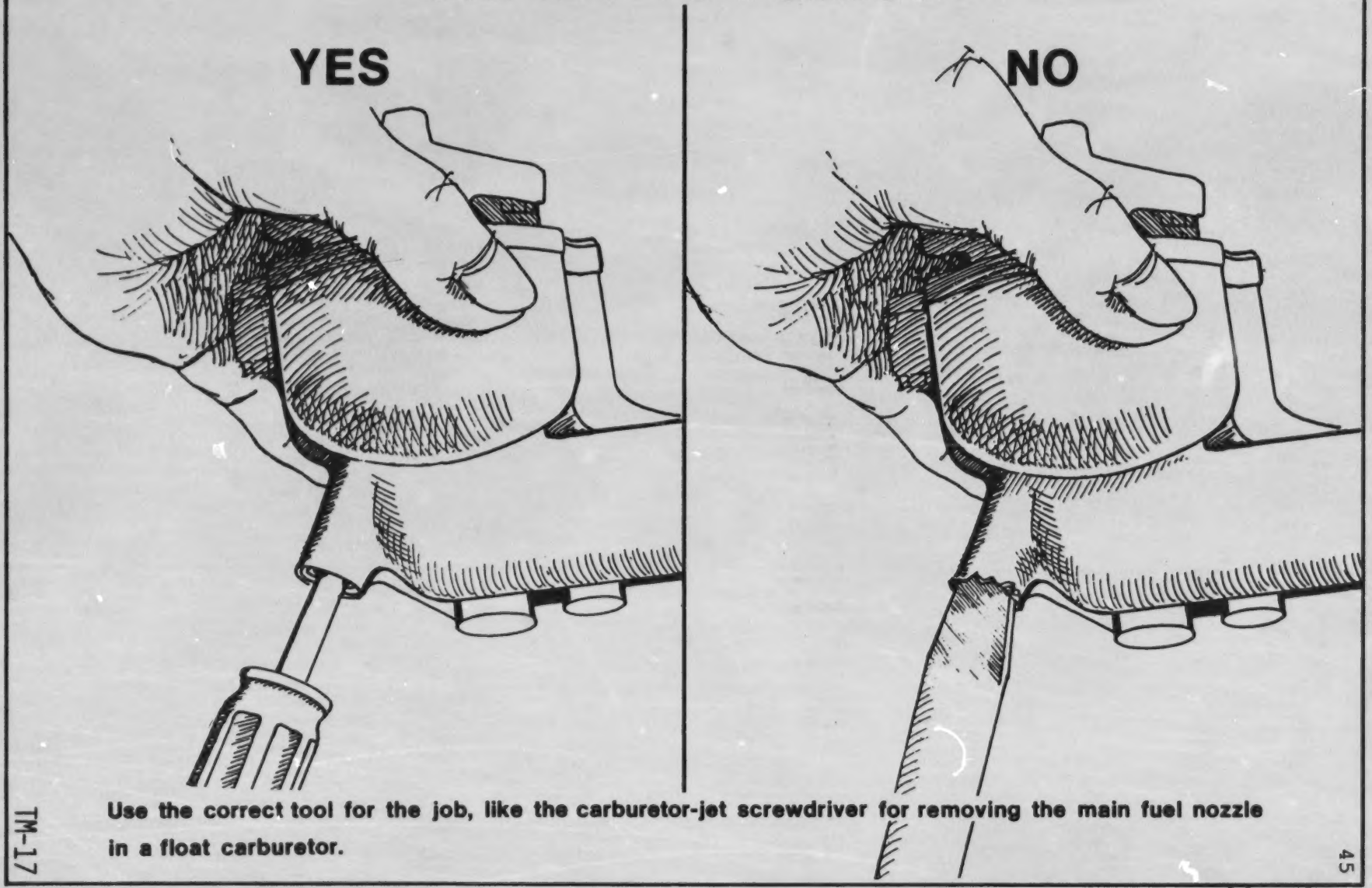
PARTS OF A SUCTION CARBURETOR WITH AN AUTOMATIC CHOKE



PARTS OF THE AUTOMATIC CHOKE



SAFETY TO FOLLOW



Use the correct tool for the job, like the carburetor-jet screwdriver for removing the main fuel nozzle in a float carburetor.

TM-17

45

SAFETY TO FOLLOW

YES

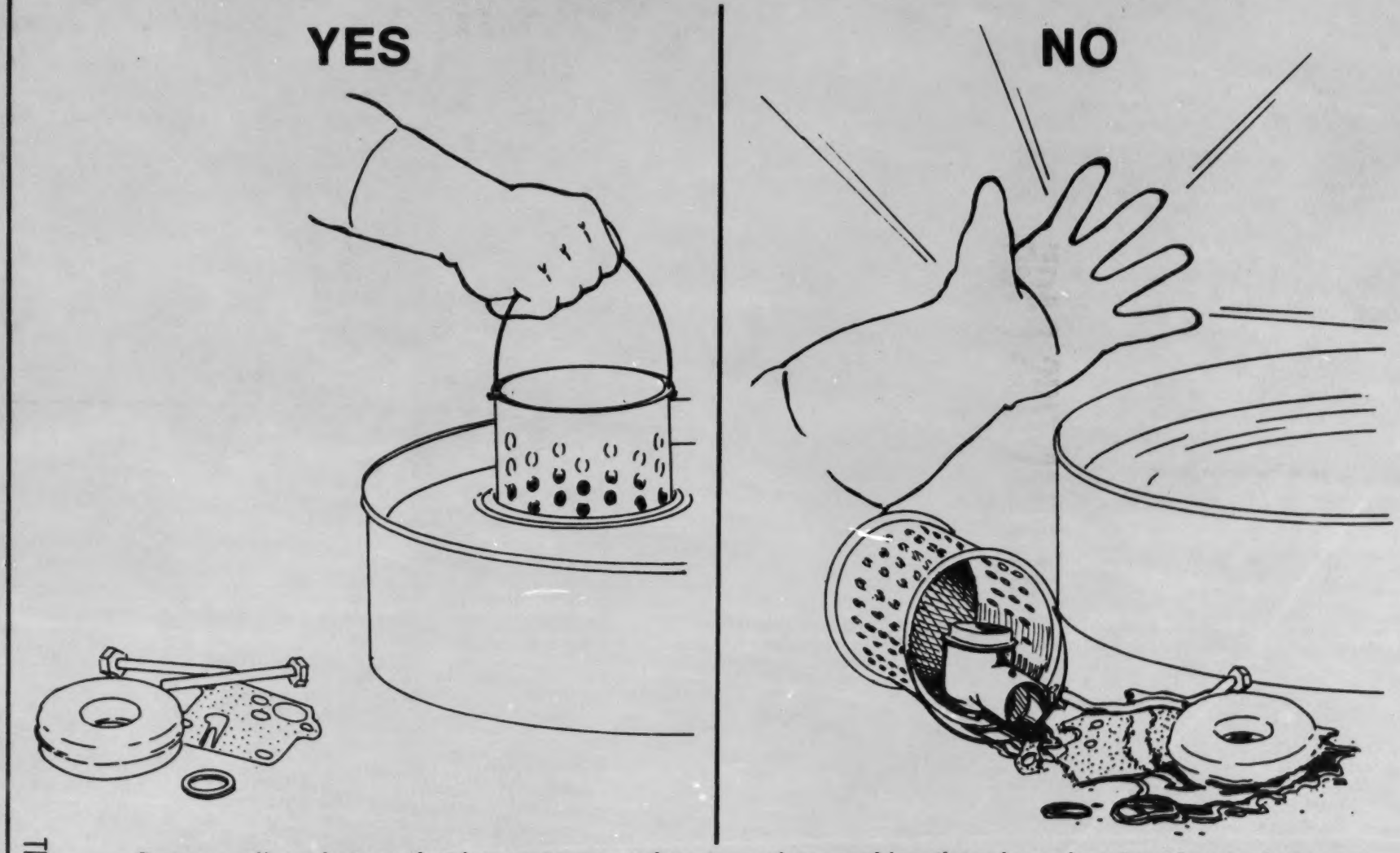
NO

When using carburetor cleaner, open a window or turn on the air in the shop and be careful not to get the cleaner on your skin or in your eyes. Carburetor cleaner can hurt you.

TM-18

47

SAFETY TO FOLLOW



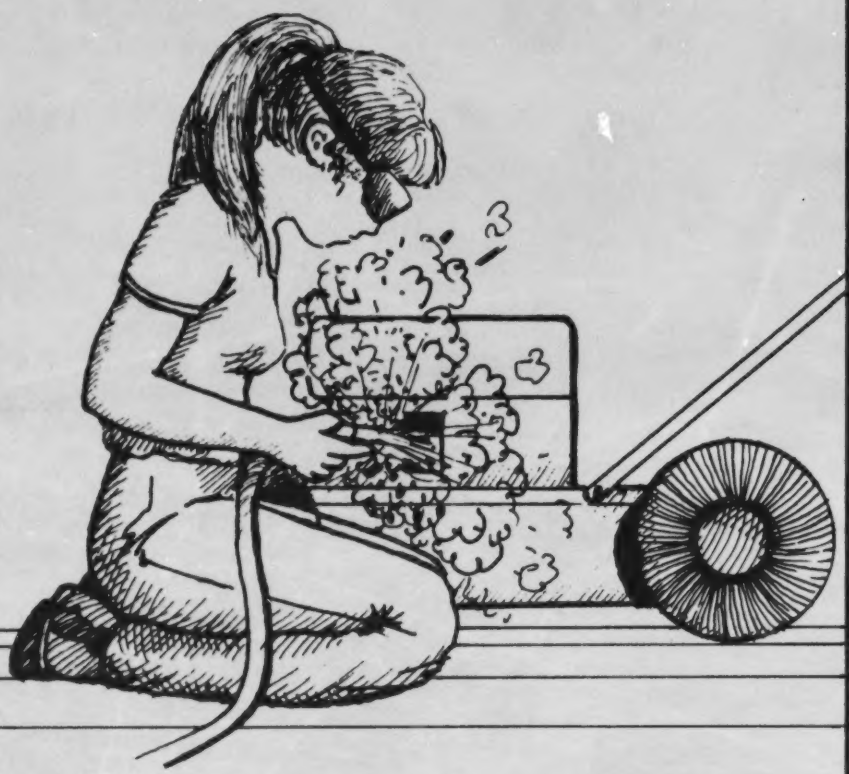
TM-19

Remove all gaskets and nylon parts on carburetors when soaking them in carburetor cleaner because these parts can melt or become brittle and break.

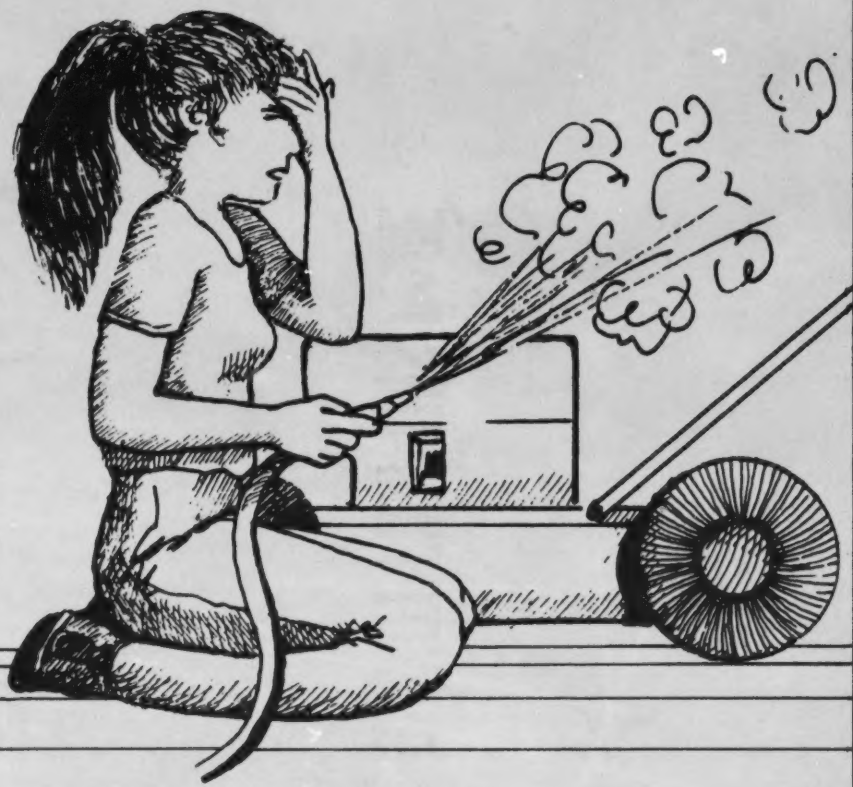
49

SAFETY TO FOLLOW

YES



NO



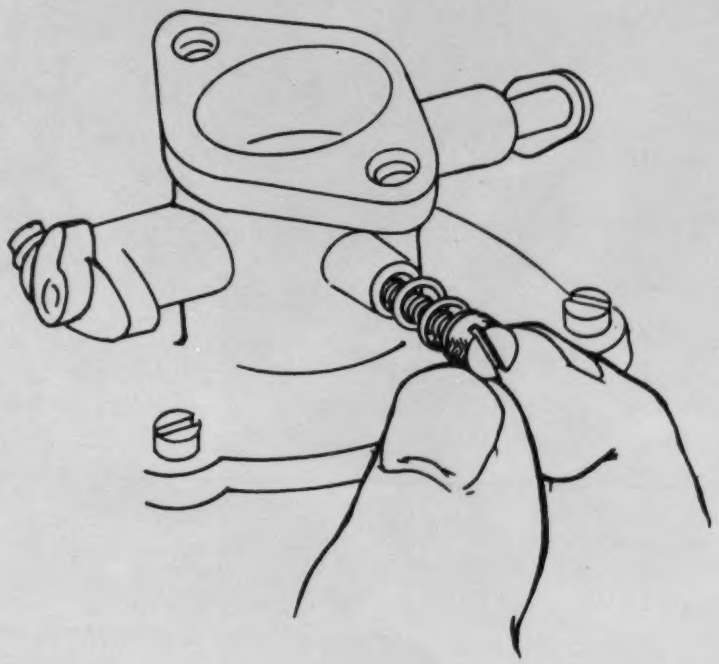
TM-20

Wear safety glasses when using compressed air. The air could blow dirt from the engine parts into your eyes.

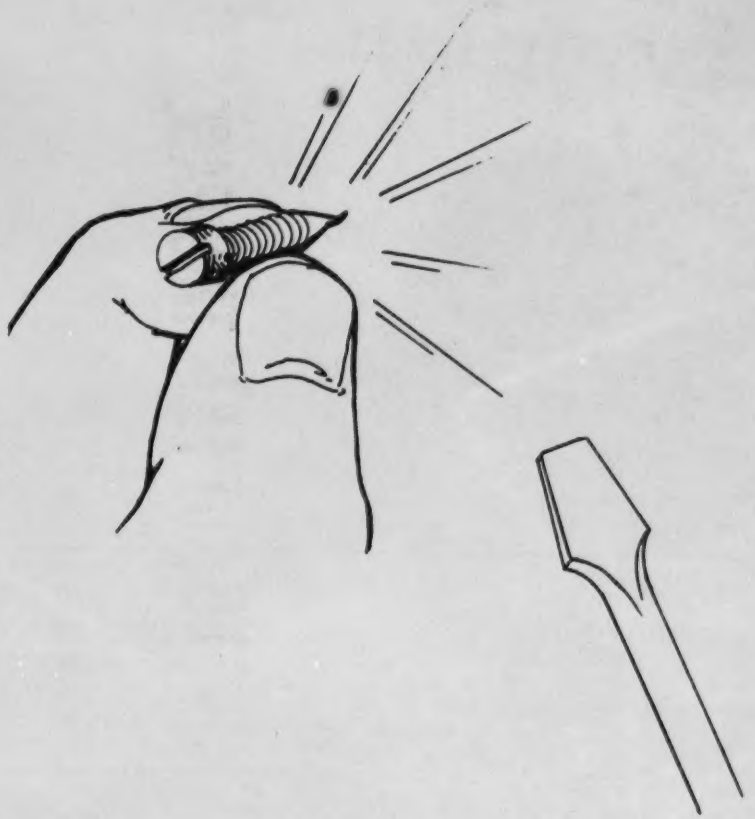
51

SAFETY TO FOLLOW

YES



NO



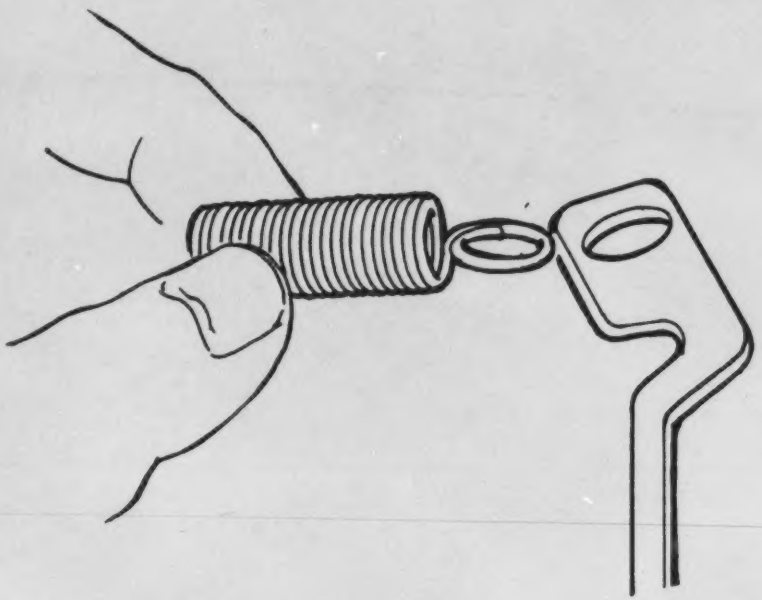
Replace carburetor needle valves just until they are seatded and not any tighter. The tip ends of the needle valves could be easily damaged if they are overtightened.

TM-21

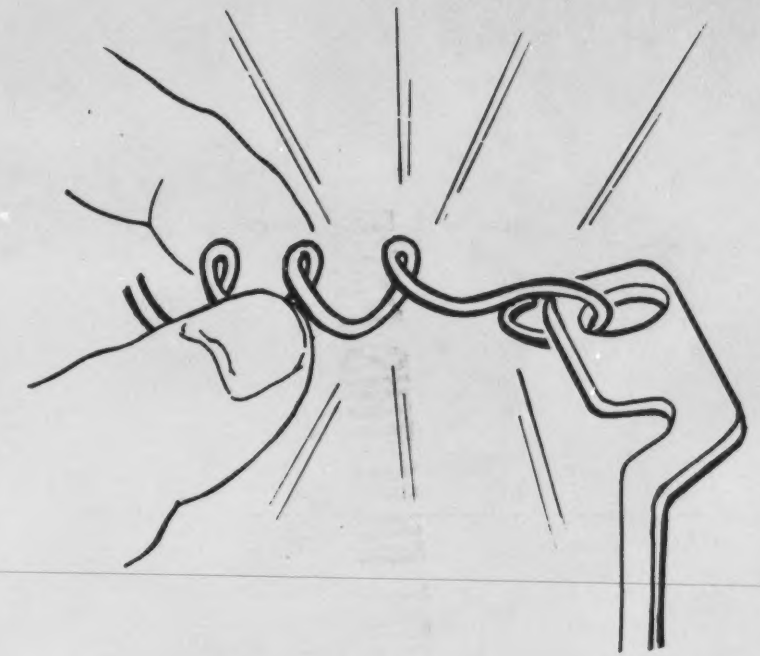
53

SAFETY TO FOLLOW

YES



NO



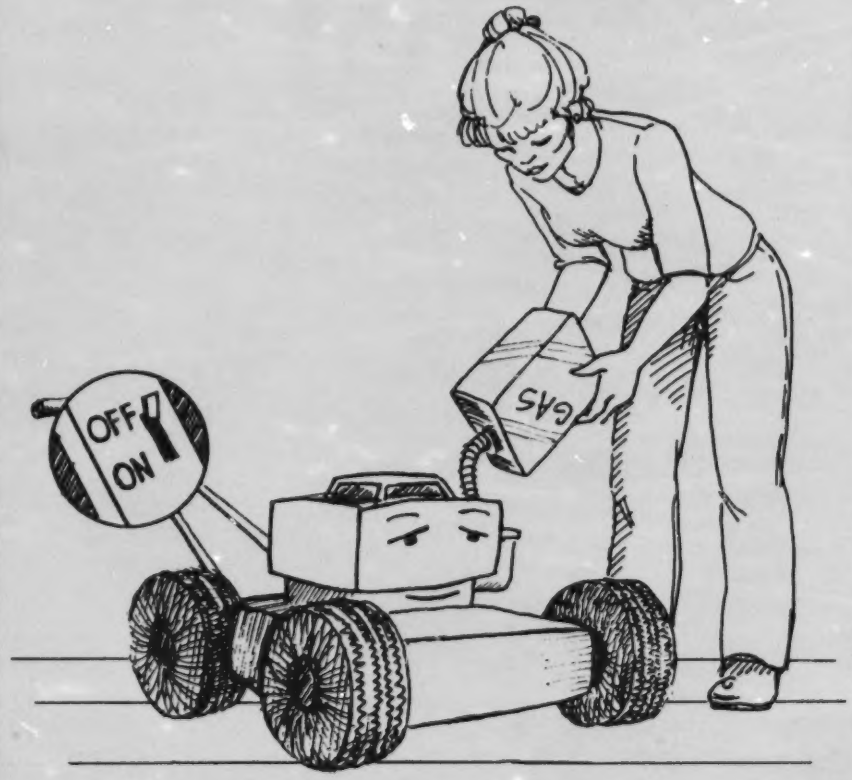
When removing a carburetor from an engine, carefully disconnect the governor spring and link so that they are not stretched out of shape. Bending or stretching them out of shape will change their shape length and cause the engine not to run properly.

TM-22

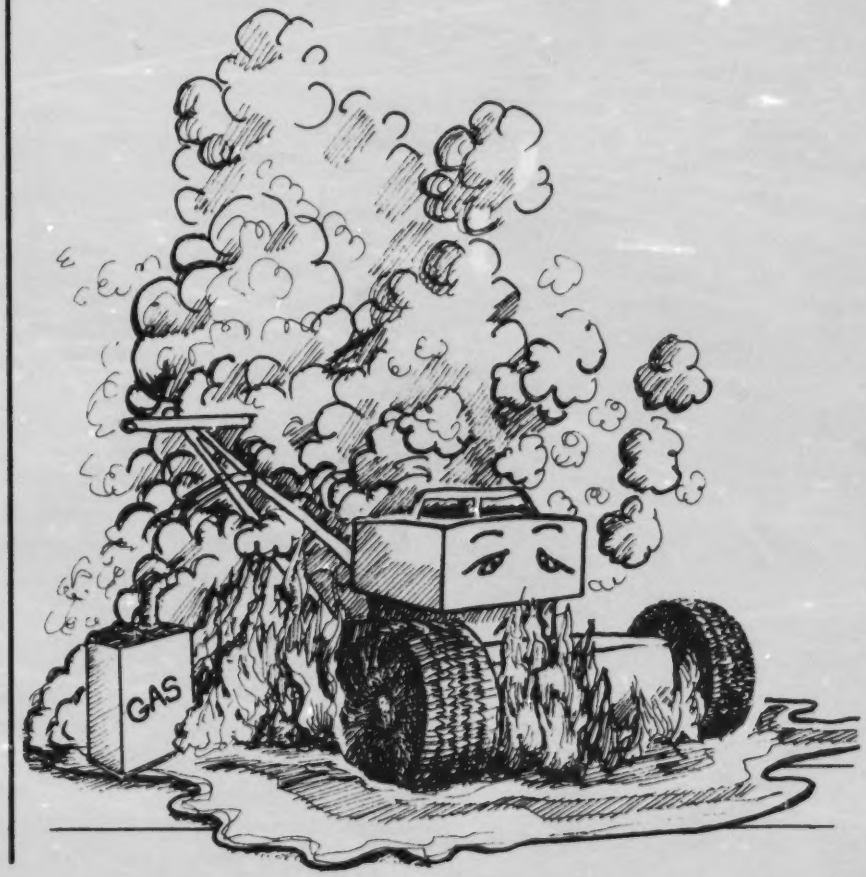
55

SAFETY TO FOLLOW

YES



NO



Always turn off the engine before filling the fuel tank. Gasoline can easily start a fire.

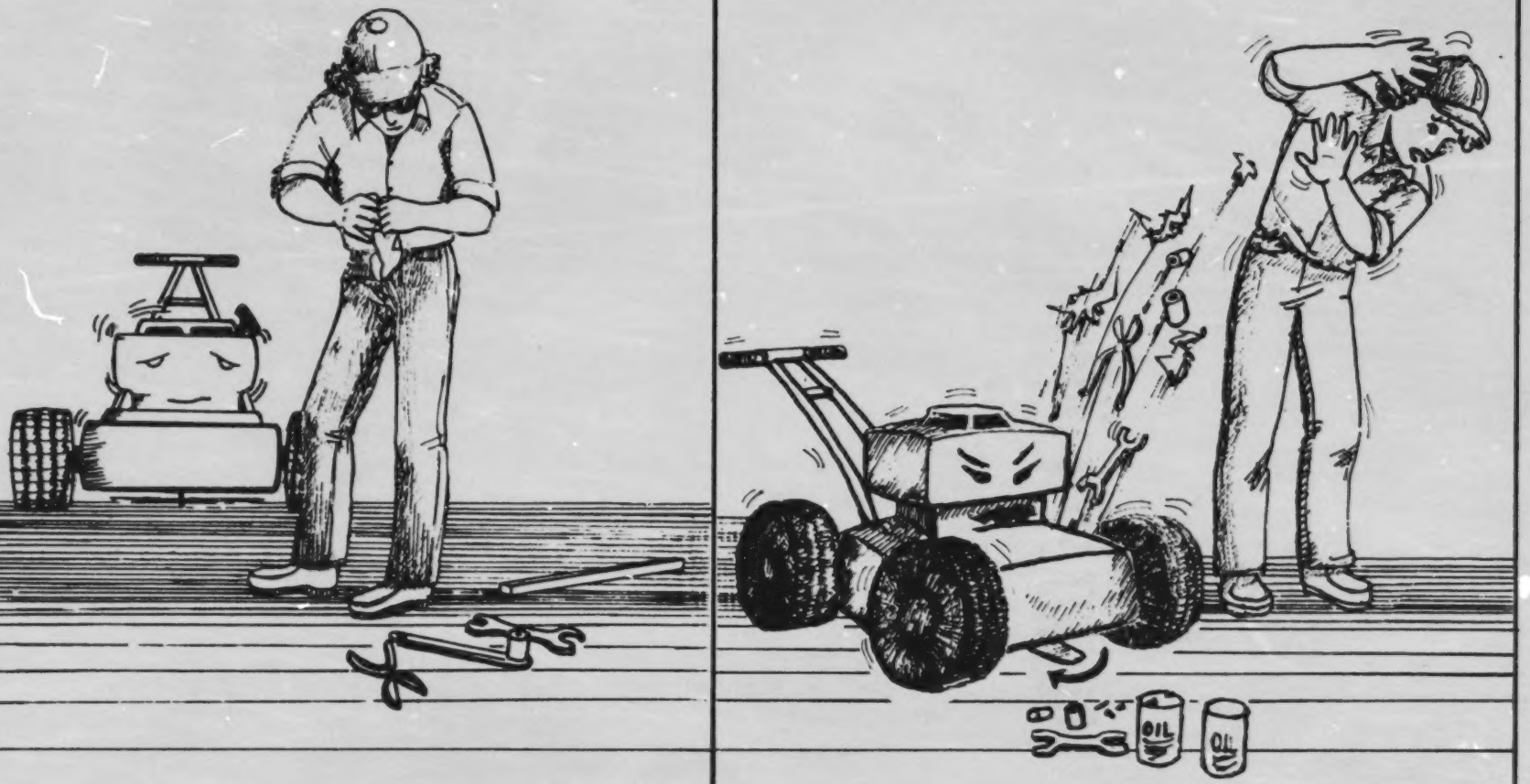
TM-23

57

SAFETY TO FOLLOW

YES

NO



TM-24

WHEN AN ENGINE IS RUNNING, KEEP TOOLS AWAY FROM MOVING PARTS.

59

Tools for
REPLACE THE CARBURETOR DIAPHRAGM

socket set

flat-tip screwdriver

straight-edge

shop towel

feeler gauge

new diaphragm

Phillips screwdriver

cleaner

"o" ring gasket

parts container

gasoline

TM-25

61

Tools for
SERVICE THE CARBURETOR AIR CLEANER

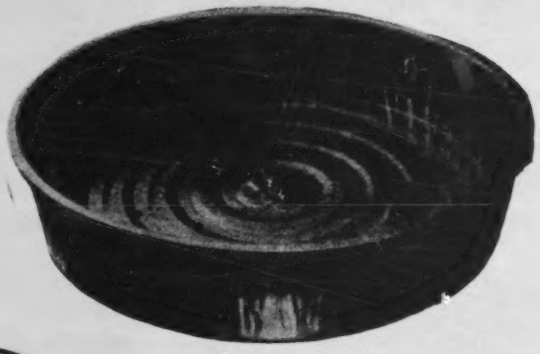
socket set

flat-tip screwdriver

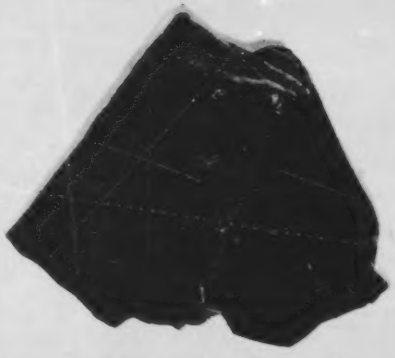
safety glasses

soap

wire brush



cleaning pan with water



2 clean shop towels

hand cleaner

cleaner

motor oil

TM-26

63

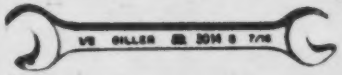
Tools for
SERVICE THE 2-PIECE FLO-JET CARBURETOR

Phillips screwdriver

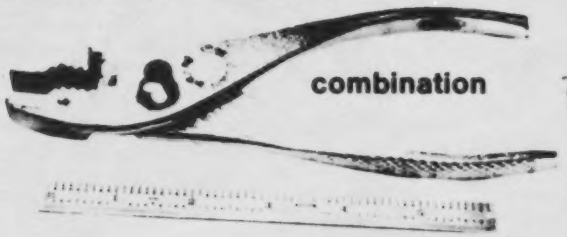
flat-tipped screwdriver

carburetor-jet screwdriver

needle nose pliers



7/16" open -end wrench



combination

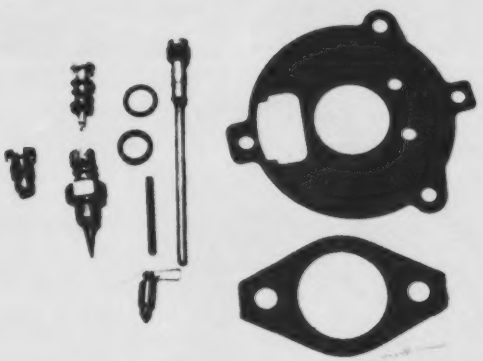
straight edge

spark plug socket and ratchet

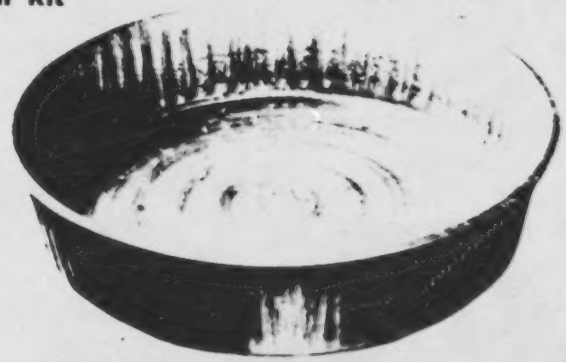
iron bar

compressed air

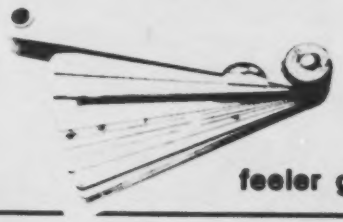
carburetor cleaner and basket



carburetor repair kit



cleaning pan with water



feeler gauge

safety glasses

TM-27

65

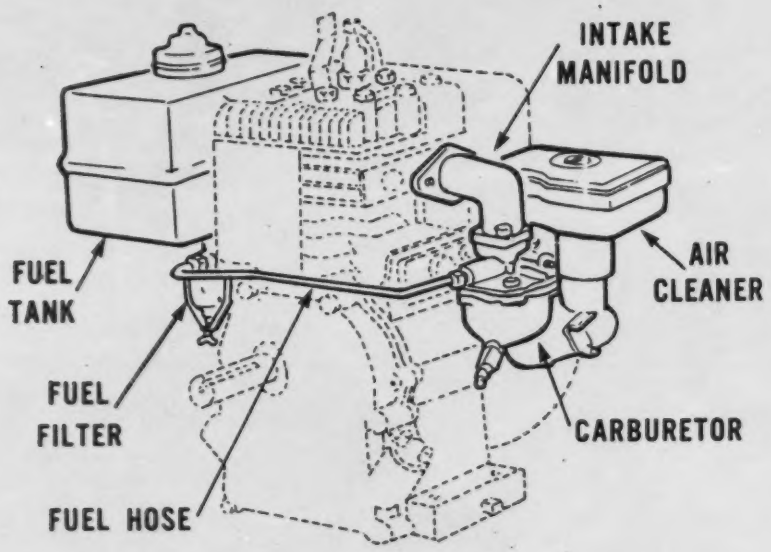
ANSWERS TO REVIEW MATERIAL IN THINGS FOR YOU TO KNOW

Page 7, What is the Fuel System: How Much Do You Remember?

1. a. clean air
   e. clean gasoline
   g. the correct mixture of clean gas and air to make the engine start and run properly

2. d. turns gas into a spray and mixes it with air
   f. carries fuel mixture to the combustion chamber
   h. gives the engine clean gas and air

Page 9, What are the Major Parts of the Fuel System: How Much Do You Remember?



Page 11, What Do the Fuel System Parts Do: How Much Do You Remember?

1. b
2. a
3. c
4. a
5. c
6. b
7. a

Page 18, What Are the 3 Types of Fuel-Feed Systems: How Much Do You Remember?

A. 1. c
   2. b

B. 1. Pump
   2. Suction
   3. Gravity

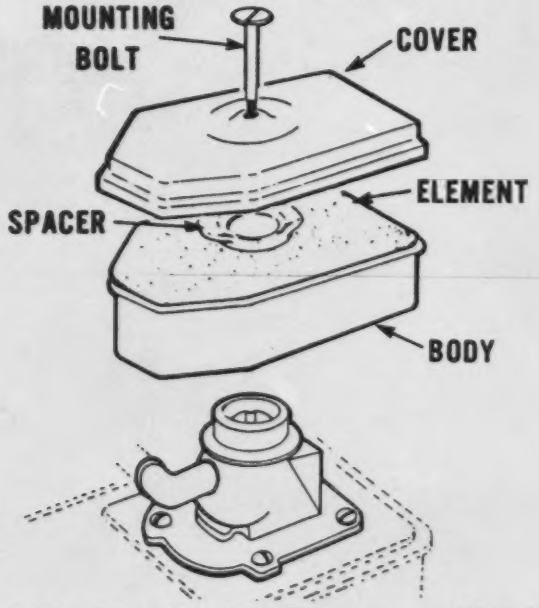
Page 23, What Does the Air Cleaner Do: How Much Do You Remember?

1. c
2. a
3. b
4. c
5. b

Page 26, Why Is It Important To Service the Air Cleaner: How Much Do You Remember?

1. a
2. b
3. c
4. c

Page 29, What Are the Parts of An Air Cleaner: How Much Do You Remember?



Page 33, What Are the 3 Types of Air Cleaners: How Much Do You Remember?

1. Dry
2. Oil-bath
3. Oil-foam

Page 39, What Does the Carburetor Do: How Much Do You Remember?

A. ✓ 1. ✓ 4.

2. ✓ 5.

3. 6.

B. Evaluated to the satisfaction of the instructor. The student's drawing should resemble a continuous flow of fuel-air mixture as depicted in the illustration in Student Manual--Introduction, page 38.

Page 47, What are the Controls of the Carburetor: How Much Do You Remember?

1. 6.

✓ 2. ✓ 7.

✓ 3. ✓ 8.

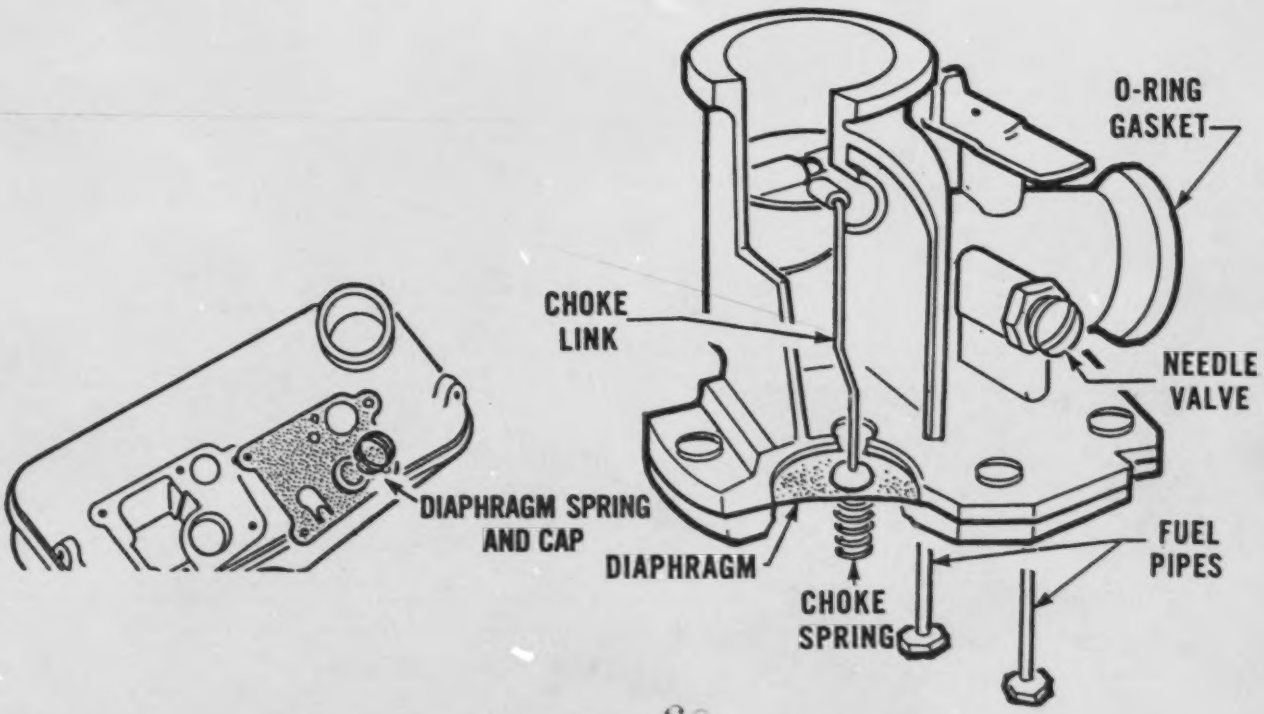
4. 9.

✓ 5. ✓ 10.

Page 52, What Are the 3 Types of Carburetor: How Much Do You Remember?

1. Suction 2. Diaphragm 3. Float

Page 56, What Are the Parts of a Suction Carburetor With an Automatic Choke: How Much Do You Remember?



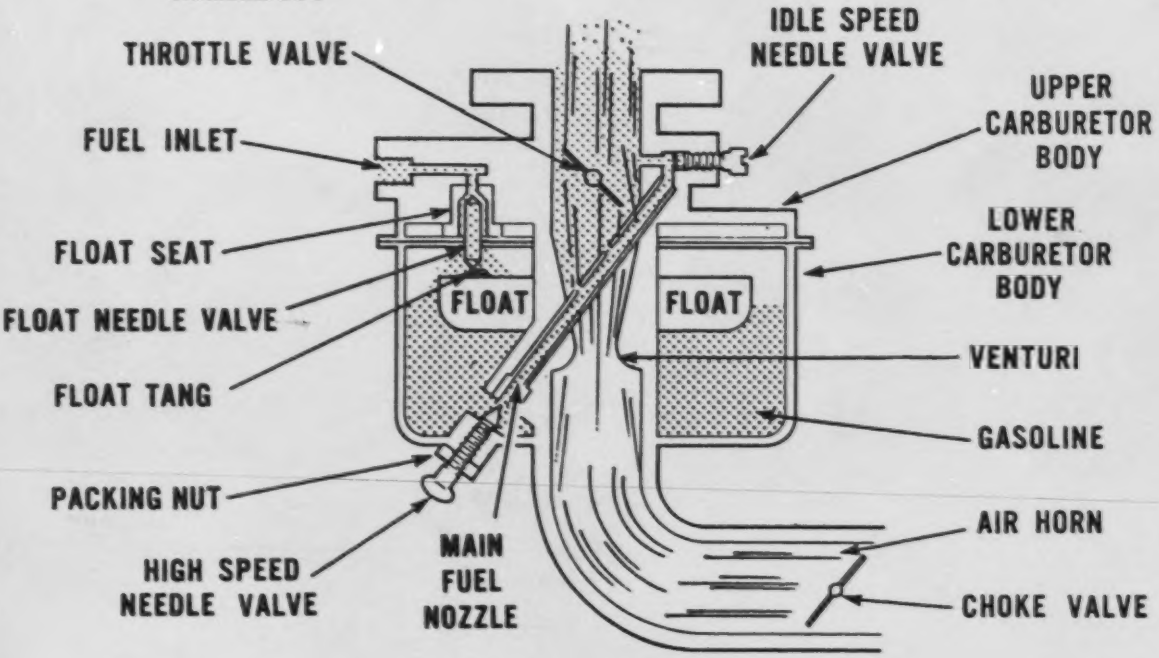
Page 58, What Do the Parts of a Suction Carburetor With an Automatic Choke Do: How Much Do You Remember?

1. c
2. b
3. c
4. a

Page 62, How Does the Automatic Choke Work: How Much Do You Remember?

Evaluated to the satisfaction of the instructor. Students should be able to state in their own words what the automatic choke is doing in each of the two pictures.

Page 66, What Are the Parts of a Float Carburetor: How Much Do You Remember?



Page 70, What Do the Parts of a Float Carburetor Do: How Much Do You Remember?

1. c
2. a
3. a
4. b
5. c
6. a
7. b
8. a
9. c
10. b

Page 86, Safety to Follow: How Much Do You Remember?

1-8. Evaluated to the satisfaction of the instructor. Students should be able to state in their own words the safety rule for each picture.

Page 92, Good Work Habits to Follow: How Much Do You Remember?

A. 1. c
2. b
3. a
4. c
5. b
6. a
7. c
8. b
9. b
10. a

B. Evaluated to the satisfaction of the instructor based on individual students' participation in the discussion.

EVALUATION MODEL

Evaluation charts are found in the student manuals after each of the sections on "Things For You to Know," "Safety and Good Work Habits to Follow," and the three fuel repair jobs. These charts are to be used by the teacher as a motivational aid and the students as a self-evaluation of individual progress toward the objectives.

The evaluation charts are designed around an evaluation model that includes the three major areas for vocational competency. These three areas are:

1. Demonstration of knowledge
2. Performance of job skills
3. Demonstration of safety and good work habits

Please note that although each of these three areas are of equal importance for vocational competency, the teaching and evaluating of safety and good work habits to special needs students cannot be overemphasized. Vocational failure of most handicapped students is frequently due to their poor personal and social development.

It is recommended that evaluation of each student's knowledge, job skills, safety, and work habits begin after the student fully understands what is expected and some achievement toward the objective is beginning to show. Because of this, the evaluation period will vary from student to student. Evaluation should last for a minimum period of two weeks or 10 consecutive school days. This length of time will allow most students to overlearn the objectives and thus achieve competency.

The rating scales for the evaluation charts are all similar. They are divided into 3 steps. Generally, these steps are:

RATING	MEANING
1 =	Does not reach the objective.
2 =	Reaches the objective, but needs help or needs to be reminded.
3 =	Reaches the objective without help. Ready for job entry with shop supervision.

Criterion for competency or the rating that a student must achieve for a predetermined length of time is suggested to be a rating of 3 on the evaluation charts for three consecutive days. For example, when a student is able to demonstrate knowledge about the fuel system or perform safety, work habits, or fuel repair jobs without help for three consecutive days, then the student has reached criterion and is considered competent in that area.

FUEL SYSTEM: Service the Carburetor Air Cleaner

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
1	(FOCUS SLIDE)	(Music up)
2	Spark plug man saying the title FUEL SYSTEM: Service The Carburetor Air Cleaner	(Music under) FUEL SYSTEM: Service The Carburetor Air Cleaner (Music fades out)
3	Lawnmower, mechanic in repair shop. Mechanic has cover off air cleaner and inspecting the element	A routine service on every small gas engine brought into a repair shop is to check and clean the air cleaner becuase a dirty air cleaner can cause serious engine problems. (music out)
4	Hand holding air cleaner. Element is dirty and needs to be serviced	Normally the air cleaner should be serviced after every 25 hours of engine operation, but more often if the engine is used where there is a lot of dust and dirt.
5	Group tool shot: socket set, flat-tip screwdriver, wire brush, safety glasses, detergent soap and water, 2 clean shop towels, hand cleaner, clean motor oil, pan for soapy water	So, before you learn the steps in servicing the air cleaner, gather all the tools you will need.
6	Socket set, flat-tip screwdriver, wire brush	You will need a socket set, flat-tip screwdriver, a wire brush, ...
7	Detergent soap, pan of water, hand cleaner	a pan of water, soap, and hand cleaner.
8	2 clean shop towels, clean crankcase oil, safety glasses	You will also need 2 clean shop towels, clean motor oil, and safety glasses if you use an air hose.
9	Hand pulling off spark plug wire	Before beginning any work on an engine, always remove the spark plug wire . . . .

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SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
10	Spark plug socket and ratchet removing the spark plug. Arrow pointing to the left	and spark plug. Remember to use a spark plug socket to remove the spark plug, and not some other tool that might damage the plug.
11	Hand with shop towel wiping away dirt from air cleaner	Using a clean shop towel, wipe away any dirt from the air cleaner. This will help keep dirt from getting into the carburetor.
12	Mechanic putting on safety glasses	If you use an air hose to blow away dirt around the air cleaner, remember to wear your safety glasses.
13	Hand and flat-tip screwdriver unscrewing mounting bolt. Arrow pointing to the left	Unscrew the mounting bolt or wing nut that holds the air cleaner on the carburetor. Set the bolt or wing nut aside.
14	Hands lifting off air cleaner from carburetor	Carefully remove the air cleaner from the carburetor. Be careful not to drop any dirt into the carburetor because dirt will seriously damage the engine.
15	Hands laying shop towel across carburetor air intake	Lay a clean shop towel across the carburetor air intake. This will keep dirt from getting into the carburetor while you are servicing the air cleaner.
16	Air cleaner in hands. One hand snapping off cover	Now, pull the air cleaner cover off the body . . .
17	Spacer sitting nearby with mounting bolt and cover. Hand removing the element from air cleaner body	and remove the spacer and element. Set the air cleaner parts aside.
18	Fingers squeezing element	If the element is made of foam, squeeze it with your hand to see if it is brittle.
19	Crumbled foam element	If the foam element is brittle and it crumbles in your hand, then you will want to replace it with a new foam element.
20	New paper element	However, if the element is a paper type and it is covered with dirt, then replace it with a new paper element.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
21	Detergent soap being poured into pan of water.	To clean the air cleaner parts, mix a small amount of soap and warm water in a cleaning pan.
22	Hand squeezing foam element in soapy water	Wash the foam element in the soapy water by squeezing and releasing the element several times with your hand. This will wash out all the dirt and grease.
23	Gasoline can and cleaning fluid can with big "X's" on them	Never use gasoline or cleaning fluid to wash a foam element because these will make the element hard and brittle. Gasoline is also very dangerous to use.
24	Air cleaner cover, body, and spacer in soapy water. Wire brush is washing the air cleaner body	Using a wire brush and soapy water, wash the other parts of the air cleaner.
25	Cleaning pan with clean water. Hand rinsing air cleaner parts	Empty the pan of soapy water, fill it with clean water, and then rinse all of the air cleaner parts.
26	Hand squeezing element that is wrapped in a shop towel	Dry the element by squeezing it in a clean shop towel several times. The element may also be dried with an air hose. Set the element aside to dry completely.
27	Shop towel drying air cleaner body	Dry the other air cleaner parts with the shop towel.
28	Hand removing shop towel from carburetor air intake	Now, remove the clean shop towel from the carburetor air intake . . .
29	Shop towel wrapped around forefinger that is wiping off carburetor air intake	With a dry shop towel, wipe off the dirt and grease from around the carburetor air intake and gasket. If the gasket is broken, replace it with a new one.
30	Motor oil being poured onto element	When the element is dry, pour a small amount, about 2 tablespoons, of clean motor oil on it. Use the same type oil that is used in the crankcase.
31	Fingers squeezing element wrapped in shop towel	Put the oiled element in a clean shop towel and squeeze out the excess oil. If too much oil is left in the element, oil will be drawn into the engine and will foul the spark plug.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
32	Close-up of oiled element	Also, squeezing the oiled element will help to place the oil evenly all over the element.
33	Hand placing element into air cleaner body	To reassemble the air cleaner parts, first place the element in the air cleaner body.
34	Hand fitting element over lip of body	Fit the element over the lip of the body so that the element will provide a protective seal or tight fit.
35	Hand placing spacer into the element. Arrow indicating where one of the low points should be placed	Place the spacer into the element so that one of the low points on the spacer is toward a narrow edge of the element.
36	Cover being snapped on the body. Arrow pointing to lip on cover and body	Snap the cover on the air cleaner body. Check to see that there is a tight fit all around the lip.
37	Air cleaner being fitted onto gasket and air intake	Now, place the air cleaner on top of the gasket and carburetor air intake.
38	Fingers tightening down mounting bolt. Arrow pointing to right	Securely tighten the mounting bolt or wing nut that holds the air cleaner on the carburetor. Don't overtighten the bolt because this could damage the carburetor or choke.
39	Spark plug socket and ratchet replacing plug. Arrow pointing to right	Replace the spark plug on the engine. Remember not to overighten the plug because it could easily break.
40	Hand replacing spark plug wire on spark plug	Replace the spark plug wire on the spark plug. (Music under)
41	Mechanic picking up tools from work area	Now, clean up the work area. Clean the tools and return them to the tool room. Empty dirty water and put up dirty shop towels.
42	Mechanic washing hands with hand cleaner	You are through with this job when you have cleaned your hands with hand cleaner and then washed them with soap.
43	Credits	(Music out)

FUEL SYSTEM: Replace the Carburetor Diaphragm

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
1	(FOCUS SLIDE)	(Music up)
2	FUEL SYSTEM: Replace the Carburetor Diaphragm (Pulsa-jet Style with Automatic Choke)	(Music under) FUEL SYSTEM: Replace the Carburetor Diaphragm on a pulsa-jet carburetor with an automatic choke.
3	Cartoon: Mechanic with puzzled look on face. Animated engine is choking and sputtering	As a small engine mechanic, you will need to know how to service a carburetor that is over-choking. (Music out)
4	Close-up of worn diaphragm	When an engine is hard to start or does not start, it may be caused by a worn out carburetor diaphragm that is leaking gasoline and over-choking the carburetor. It will need to be replaced with a new one.
5	Group tool shot: socket set, shop towel, new diaphragm, flat-tip screwdriver, straightedge, feeler gauge, carburetor cleaner, Phillips screwdriver, new "O" ring, gasoline, parts container	Before you begin to replace the diaphragm, gather all the tools you will need.
6	Socket set, Phillips screwdrivers, parts container	You will need a socket set, Phillips screwdriver, a flat-tip screwdriver, and a parts container, . . .
7	Straightedge, feeler gauge, shop towel, new diaphragm	a straightedge, feeler gauge, shop towel, and a new carburetor diaphragm.
8	Carburetor cleaner, gasoline	You will also need carburetor cleaner if the carburetor and fuel tank are very dirty and gasoline to fill up the fuel tank.
9	Side view of carburetor intake tube and new "O" ring gasket	If the "O" ring gasket in the intake tube is badly worn or cracked, you will also want to replace it with a new one.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
10	Socket set and nut driver removing spark plug. Arrow pointing to the left	First, pull off the spark plug wire and remove the spark plug from the engine. Remember to use a spark plug socket when removing the spark plug because using another tool could damage the spark plug.
11	Hand lifting off air cleaner from carburetor	Using a flat-tip screwdriver, remove the mounting bolt and air cleaner from the carburetor. Set the bolt and air cleaner aside.
12	Screwdriver loosening bolt. Arrow pointing to left	Loosen the throttle cable clamp bolt and remove the cable from the throttle.
13	Hand pulling off breather hose from carburetor and breather tubes	Carefully pull off the breather hose that is connected to the carburetor tube and crankcase breather tube. Set the hose aside.
14	Arrows pointing to 2 bolts which hold carburetor and fuel tank on engine	There are 2 mounting bolts which hold the carburetor and fuel tank to the engine. The bolts are 2 different sizes.
15	7/16" socket and ratchet removing bolt. Arrow pointing to left	To remove the smaller bolt, use a 7/16" socket and ratchet. Put the bolt and its washer in the parts container so that they are not lost or mixed up with other bolts.
16	1/2" socket, extension, and ratchet removing bolt. Arrow pointing to left	To remove the larger bolt, use a 1/2" socket, extension, and ratchet. Put this bolt and its washer with the others in the parts container.
17	Hands loosening carburetor and fuel tank from crankcase intake tube	Carefully loosen the carburetor and fuel tank from the crankcase intake tube. Do not pull it off completely because the governor spring and link that are still connected to the throttle could be damaged.
18	Hand twisting spring end loop at throttle hole	Now, unhook the governor spring from the throttle by carefully twisting the spring end loop out of the throttle hole. Be careful not to bend the spring loop out of shape.
19	Hand removing governor link from throttle	Also unhook the governor link at the throttle by slightly tilting the carburetor and fuel tank toward the engine and slipping the link out of the hole on the throttle.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
20	Hands placing carburetor and fuel tank on work bench	Remove the carburetor and fuel tank and set them on your work bench.
21	Screwdriver removing bolt on choke link cover. Arrow pointing to left	If the carburetor has an automatic choke on it, remove the choke link cover and bolt using a flat-tip screwdriver. Set the cover, gasket, and bolt in the parts container.
22	Fingers pulling out choke link from choke shaft	Carefully pull out the choke link from the choke shaft.
23	Screwdriver removing a bolt. Arrow pointing toward the left	With a flat-tip screwdriver, remove the mounting bolts which hole the carburetor onto the fuel tank.
24	Arrow poiating to mounting bolt underneath choke plate. Phillips screwdriver nearby	On some types of carburetors, there will also be a mounting bolt inside the carburetor and underneath the choke plate. Use a Phillips screwdriver to remove this bolt.
25	Hand placing bolts and washers in parts container	Place these bolts and washers together in the parts container.
26	Screwdriver lifting carburetor from fuel tank	Now carefully separate the carburetor from the fuel tank, being careful not to damage the fuel pipes and choke link. You may need to use a flat-tip screwdriver to help separate the two.
27	Hand removing fuel pump spring and cap	Remove the fuel pump spring and cap between the carburetor and diaphragm. Place the spring and cap in the parts container.
28	Hand removing diaphragm from fuel tank	Remove the old diaphragm from the fuel tank and put it in the trash.
29	Arrow pointing to "O" ring gasket	Check the "O" ring gasket on the carburetor to see if it is brittle, torn, or pulled out of shape. If it is, then you will want to replace it with a new one.
30	Shop towel wiping bottom of carburetor	With a shop towel, wipe off any dirt and grease on the bottom of the carburetor, . . .

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
31	Shop towel wiping top of fuel tank	and the top of the fuel tank.
32	Hand holding carburetor. Fuel tank in carburetor cleaner.	If the carburetor and fuel tank are very dirty, then soak them in carburetor cleaner. Be sure to remove all the nylon and rubber parts such as the fuel pipes, "O" ring gasket, and automatic choke shaft before soaking them in the cleaner.
33	Straightedge across middle area of fuel tank	To check the top of the fuel tank to see if it is warped, hold the straightedge across the middle area. This area has been painted red so that you can easily see it.
34	.002" Feeler gauge close to straightedge and fuel tank top	Now try to fit a .002" feeler gauge between the straight edge and the 2 reds areas on top of the fuel tank. If the tank top is flat, the gauge will not fit between the straightedge and fuel tank.
35	.002" Feeler gauge fitting between straightedge and fuel tank top	If the fuel tank top is warped, then the diaphragm will not give a tight seal between the carburetor and tank, and then gasoline could easily enter the carburetor and cause engine problems. Always replace a warped fuel tank with a new one.
36	Hand placing automatic choke spring into plastic lock on new diaphragm	To put in a new diaphragm, first, place the automatic choke spring into the plastic lock on the bottom of the new diaphragm. Be careful not to bend or stretch the spring.
37	Hands placing new diaphragm on top of fuel tank	Carefully place the new diaphragm on the fuel tank. Match up the holes in the diaphragm with the openings on the fuel tank and fit the choke spring into the fuel tank spring pocket.
38	Hand placing fuel pump spring and cap on diaphragm	Place the fuel pump spring and cap over the round recess on top of the diaphragm.
39	Hand holding up choke link, other hand placing carburetor onto diaphragm	While holding up the automatic choke link, carefully place the carburetor on top of the diaphragm.
40	Fuel pipes going through holes on diaphragm and choke link going through hole on carburetor	Fit the fuel pipes through the 2 holes on the diaphragm and the automatic choke link through the link hole on the carburetor.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
41	Hand replacing bolt inside carburetor	Now, securely tighten the mounting bolt that is found inside the carburetor under the choke plate.
42	Finger screwing down mounting bolt. Arrow pointing to right	With your fingers thread the other mounting bolts down 2 turns. Do not tighten the bolts until the automatic choke has been assembled.
43	Finger holding choke plate closed	To assemble the automatic choke, first hold the choke plate closed with your finger, . . .
44	Fingers placing choke link into choke shaft	and then place the choke link into the choke shaft.
45	Arrow pointing to open choke plate	Open the choke plate, . . .
46	Screwdriver near a mounting bolt. Each mounting bolt is numbered in a sequenced pattern	and alternately tighten the mounting bolts in a staggered sequence, as they are numbered in this picture. This will keep from bending the fuel tank or carburetor out of shape. Make sure the choke plate stays open while you are tightening the bolts.
47	Normal position of choke plate	Move the choke plate to a normal position. The plate should now fully close. If it doesn't, then check the choke spring to see if it is on the diaphragm correctly.
48	Hand replacing the automatic choke link cover	Replace the automatic choke link gasket and cover. Tighten the cover bolt with a flat-tip screwdriver.
49	Hand hooking governor link to throttle	Holding the carburetor and fuel tank at an angle and close to the crankcase, hook the governor link to the throttle. Make sure the governor link and spring are still hooked to the governor blade.
50	Hands placing carburetor onto crankcase intake tube. Arrow pointing to intake tube	Now, move the throttle to the left and fit the carburetor onto the crankcase intake tube. Be careful not to bend the "O" ring gasket in the carburetor.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
51	Fingers twisting governor spring onto throttle	Carefully twist the governor spring onto the throttle.
52	7/16" socket and ratchet replacing smaller mounting bolt. Arrow pointing to right	Replace the two mounting bolts which hold the carburetor and fuel tank to the engine. Use a 7/16" socket and ratchet for the smaller bolt, . . .
53	1/2" socket, extension, and ratchet replacing larger mounting bolt. Arrow pointing to right	and a 1/2" socket, extension, and ratchet for the larger bolt.
54	Fingers replacing breather hose onto carburetor and breather tubes	Replace the breather hose on the carburetor and breather tubes.
55	Hand hooking the throttle cable into the throttle	Hook the throttle cable onto the throttle and tighten the throttle cable clamp and bolt using a flat-tip screwdriver.
56	Screwdriver tightening down the air cleaner bolt. Arrow pointing to right	Replace the air cleaner and bolt on top of the carburetor, . . .
57	Hand replacing spark plug wire	and replace the spark plug and spark plug wire.
58	Gas can filling tank with gasoline	Now, fill the fuel tank at least half full with gasoline, . . .
59	Hand cranking engine	and start the engine. Let it run about 2 minutes to warm up and, . . .
60	Hand adjusting throttle on engine	then make any necessary adjustments on the carburetor or throttle so that the sound of the engine is normal.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
61	Mechanic picking up tools on work bench	(Music under) You are finished with this job when you have returned tools to the tool room and cleaned up your work area. (Music up)
62	(CREDIT SLIDE)	(Music out)

FUEL SYSTEM: Service the Two-Piece Flo-Jet Carburetor

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
1	(Focus slide)	(Music up)
2	FUEL SYSTEM: Service The Two-Piece Flo-Jet Carburetor	(Music under) FUEL SYSTEM: Service the Two-Piece Flo-Jet Carburetor
3	Cartoon: Mechanic with puzzled look on face. Animated engine is showing signs of wear	As a small engine mechanic, you will need to know how to service a two-piece flo-jet carburetor . . . (music out)
4	Illustration: Cutaway of two-piece flo-jet carburetor. Arrows pointing to needles, valves, seat, and float	because as the engine is used, wear and vibration cause the carburetor to become dirty and wear out the needles, valves, seat, and float.
5	Group tool shot: Phillips and flat-tip screwdrivers, carburetor-jet screwdriver, needle nose pliers, combination pliers, spark plug socket and ratchet, 7/16" open-end wrench, straight-edge, feeler gauge, iron bar, carburetor cleaner and basket, cleaning pan with water, compressed air	Before you learn how to do this job, gather all the tools you will need.
6	Spark plug socket and ratchet 7/16" open end wrench, needle nose pliers, combination pliers, Phillips screwdriver, flat-tip screwdriver, and carburetor-jet screwdriver	You will need a spark plug socket and ratchet, 7/16" open end wrench; needle nose pliers, combination pliers or hose clamp pliers, and three screwdrivers--a large Phillips; a 3/8" flat-tip; and a carburetor-jet screwdriver, . . .

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
7	Straightedge, feeler gauge, iron bar, carburetor cleaner, basket, cleaning pan with water, compressed air, safety glasses	a straightedge, feeler gauge, short iron bar, carburetor cleaner and a basket, a cleaning pan with water, compressed air, and safety glasses.
8	Carburetor repair kit	You will also need a new carburetor repair kit with new gaskets, needles, float valve, and seat.
9	Spark plug socket and ratchet removing spark plug. Arrow pointing to left	To begin, remove the spark plug wire and spark plug. Remember to use a spark plug socket to remove the spark plug because another tool may damage the spark plug.
10	Hand turning off fuel shut-off valve. Arrow pointing to right	Close the fuel shut-off valve by turning the thumb screw until it is tight. Don't force the thumb screw too tight because this could damage it. Also, if the throttle cable is connected to the engine, then disconnect it.
11	Pliers pinching hose clamp open	To remove the fuel hose on the carburetor, first use pliers to remove the hose clamp . . .
12	Fingers pulling off fuel hose from carburetor	and twist the fuel hose off the carburetor. You may need to pull and twist hard on the hose to loosen it.
13	Fingers pulling off breather hose from air cleaner tube	Now, gently pull the crankcase breather hose off the air cleaner tube . . .
14	Hand lifting off air cleaner cover and foam element	and remove the air cleaner wing nut, cover, and foam element. Set these aside.
15	Phillips screwdirver removing a screw on the intake manifold. Arrow pointing to left	With a large Phillips screwdriver, remove the two screws which join the carburetor to the intake manifold.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
16	Open-end wrench removing bolt under carburetor. Arrow pointing to right	On some engines, there may be a bolt and brace that holds the carburetor and air cleaner together. Use a 7/16" open-end wrench to remove this bolt and brace.
17	Fingers unhooking governor link	When the carburetor is loose, tilt it toward the engine and unhook the governor link on the throttle shaft . . .
18	Fingers unhooking automatic choke link	and the automatic choke link on the choke valve.
19	Hand pulling off air cleaner tube from carburetor	Gently pull off the air cleaner tube from the carburetor and then set the carburetor on your work bench.
20	Arrow pointing to space between upper and lower carburetor bodies	Check the upper carburetor body for warpage between the upper and lower bodies at the air vent boss, just below the idle valve.
21	.002" feeler gauge next to space between upper and lower carburetor bodies	To do this, try to fit a .002" feeler gauge into this space. If the gauge fits, then the upper carburetor body is warped and it will need to be replaced with a new one.
22	Fingers placing iron bar between throttle shaft and upper carburetor body	Now, check the throttle shaft and bushings for wear. To do this, place a short iron bar between the throttle shaft and upper carburetor body.
23	Finger holding shaft down, feeler gauge placed between shaft and iron bar	Hold the throttle shaft down on the iron bar, and with the feeler gauge, find the correct size that will fit between the shaft and bar. Write down this size.
24	Finger holding shaft up, feeler gauge placed between shaft and iron bar	Now, hold the throttle shaft up and again find the correct size that will fit between the shaft and bar. Write down this size.
25	Illustration: .013" - .012" .001"	Subtract these two sizes. The difference should not be more than .010". If it is, then either the throttle shaft should be rebushed or the upper carburetor body replaced, or both.

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SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
26	Fingers unscrewing idle valve Arrow pointing to left	Now you are ready to disassemble the carburetor. First, remove the idle needle valve. You can probably do this with your fingers, but if not, use a flat-tip screwdriver. Set the idle valve and its spring aside.
27	Open-end wrench unscrewing packing nut. Arrow pointing to left	Loosen the packing nut and high speed needle valve with the 7/16" open-end wrench and remove the packing nut and needle valve together.
28	Two needle valves, close-up of tip ends	Check the tip ends of the two needle valves for damage and wear. If the tip ends have worn thin or have ridges, replace them and their seats with new ones.
29	Screwdriver removing fuel nozzle. Arrow pointing to left	With the carburetor-jet screwdriver, carefully remove the main fuel nozzle. It is found inside the lower carburetor body where the high speed needle valve is located.
30	Large flat-tip screwdriver and carburetor-jet screwdriver. An X is over the large screwdriver	When removing the main fuel nozzle, be sure to use a carburetor-jet screwdriver, and not a larger screwdriver that could damage the inside threads for the high speed needle valve.
31	Fingers removing fuel nozzle Arrow pointing to holes and passageway	Check the nozzle for dirt and damage. Make sure all the holes are open and clear. Set the nozzle aside.
32	Screwdriver removing a mounting bolt on carburetor. Arrow pointing to left	Now, remove the mounting bolts holding the upper and lower carburetor bodies together. Set these bolts and washers aside.
33	Hands separating upper and lower carburetor bodies	Gently separate the upper body from the lower body and set the lower body aside. The float hinge pin holding the float in place on the upper body may fall out, so be careful not to drop them.
34	Needle nose pliers pulling out float hinge pin	If the hinge pin did not fall out, remove it with the needle nose pliers.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
35	Hand removing float and float valve	Carefully remove the float and float valve. Gently shake the float near your ear to see if it has gasoline inside it. If the float is crushed or it sounds like it has gasoline inside it, it must be replaced with a new one.
36	Fingers removing old float valve, spring clip. New one nearby	Remove the float valve by slipping the spring clip off the float tang. Put this old float valve in the trash, and connect the new valve onto the float tang. Set the float and new valve aside.
37	Fingers removing carburetor gasket	Now remove the gasket on the upper carburetor body and put this in the trash. You will always want to replace old gaskets with new ones, because old ones may harden and leak.
38	Arrow pointing to float valve seat	Check the float valve seat on the upper carburetor body for damage. This seat is the pressed-in type and will only need to be replaced if it has nicks or cuts on it, or if the float needle valve is replaced.
39	Hand placing carburetor parts in cleaning basket. Carburetor cleaner nearby	Now, you will want to clean the carburetor parts of dirt and buildup. Place the parts except the gaskets, float, and rubber parts in a carburetor cleaner basket.
40	Hand putting basket into carburetor cleaner. Clock nearby	Put the basket in the carburetor cleaner and gently move it up and down to circulate the cleaner through the parts. Then let the parts set in the cleaner for no more than 30 minutes.
41	Clock showing 30 minutes have passed. Carburetor cleaner nearby. Hand rinsing basket and parts in cleaning pan of water	When 30 minutes are up, remove the basket from the cleaner and rinse the parts in the basket thoroughly with water.
42	Parts lying on a shop towel. Air hose drying one of the parts	Dry the parts, one at a time, with compressed air. Be sure to blow out all the holes in the two carburetor bodies. Remember to wear your safety glasses when using compressed air.
43	Hand placing float and float valve on top of new carburetor gasket	When the parts are dry, put a new carburetor gasket on the upper carburetor body and carefully place the float and float valve on top of the gasket.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
44	Hand holding up float; other hand replacing float hinge pin	To replace the float hinge pin, slightly lift up the float and gently push the pin through the hinges with your fingers. Lifting up the float will help line up the hinges so that the pin can be pushed through easily.
45	Hand holding straightedge across float. Arrows pointing to distance that is to be measured	Now you are ready to check the float level. Place the straightedge across the float bottom from the hinge point to the opposite side and measure the distance between the carburetor gasket and straightedge on both sides of the float. The distance should be the same on both sides.
46	Needle nose pliers bending float tang	If the distance is not the same on both sides, then the float is not parallel to the carburetor. To adjust the float level, carefully bend the float tang until both sides are parallel. Do not press on the float to adjust it because it will easily crush.
47	Hand replacing lower carburetor body on upper body	Now put the carburetor back together. First, place the lower carburetor body on the upper carburetor body, being careful not to damage the float.
48	Fingers replacing a mounting bolt on carburetor	Fasten the two bodies together with the mounting bolts.
49	Fingers replacing fuel nozzle. Arrow pointing to right. Screwdriver nearby	Replace the main fuel nozzle, using the carburetor-jet screwdriver.
50	Fingers replacing idle speed needle valve. Arrow pointing to right	Using your fingers only, replace the idle speed needle valve until it is seated. Don't overtighten it because the pointed end could be damaged.
51	Fingers backing off 3/4 turn. Arrow pointing to left	Now, back off the idle valve 3/4 turn.
52	Fingers screwing in packing nut. Arrow pointing to right	Replace the packing nut with the high speed needle valve in it. Seat the high speed needle valve.
53	Fingers backing off 1¼ turns on needle valve. Arrow pointing to left	Back off this needle valve 1¼ turns. Do not tighten the packing nut.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
54	Hands pushing air cleaner tube and carburetor together	Now, push the air cleaner tube onto the carburetor.
55	Fingers hooking choke link to choke valve	Hook the automatic choke link on the choke valve . . .
56	Carburetor tilted toward engine. Fingers hooking governor link to throttle shaft	and while tilting the carburetor near the engine, hook the governor link on the throttle shaft.
57	Hand placing new gasket on carburetor	Place a new intake manifold gasket on top of the carburetor . . .
58	Hands fitting carburetor under manifold	and fit the carburetor under the intake manifold, making sure the gasket stays in place.
59	Phillips screwdriver replacing a mounting screw on manifold. Arrow pointing to right	Tighten down the 2 mounting screws on the intake manifold with a Phillips screwdriver . . .
60	Open-end wrench replacing bolt on carburetor bottom. Arrow pointing to left	and replace the bolt and brace on the bottom of the carburetor.
61	Fingers pushing breather hose into air cleaner tube	Push the crankcase breather hose into the air cleaner tube . . .
62	Fingers pushing on fuel hose. Hose clamp nearby	and the fuel hose onto the carburetor. Fit the hose clamp over the fuel hose and carburetor.
63	Hand replacing cover on air cleaner element	Replace the air cleaner element, cover, and wing nut.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
64	Fingers opening fuel shut-off valve. Arrow pointing to left	Open the fuel shut-off valve and check the carburetor for leaks.
65	Fingers replacing spark plug wire	Replace the spark plug, spark plug wire, and throttle cable.
66	Hand pulling starter rope	Now, crank the engine and let it run for about two minutes.
67	Fingers adjusting the idle speed	Adjust the carburetor until the engine idles smoothly and then accelerates to half speed without hesitation or sputtering.
68	Hands picking up tools from work area	When the engine sounds like it is running properly, clean up your work area. (Music under) You are through with this job when tools have been cleaned and replaced in the tool room. (Music up)
69	CREDITS	(Music out)

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